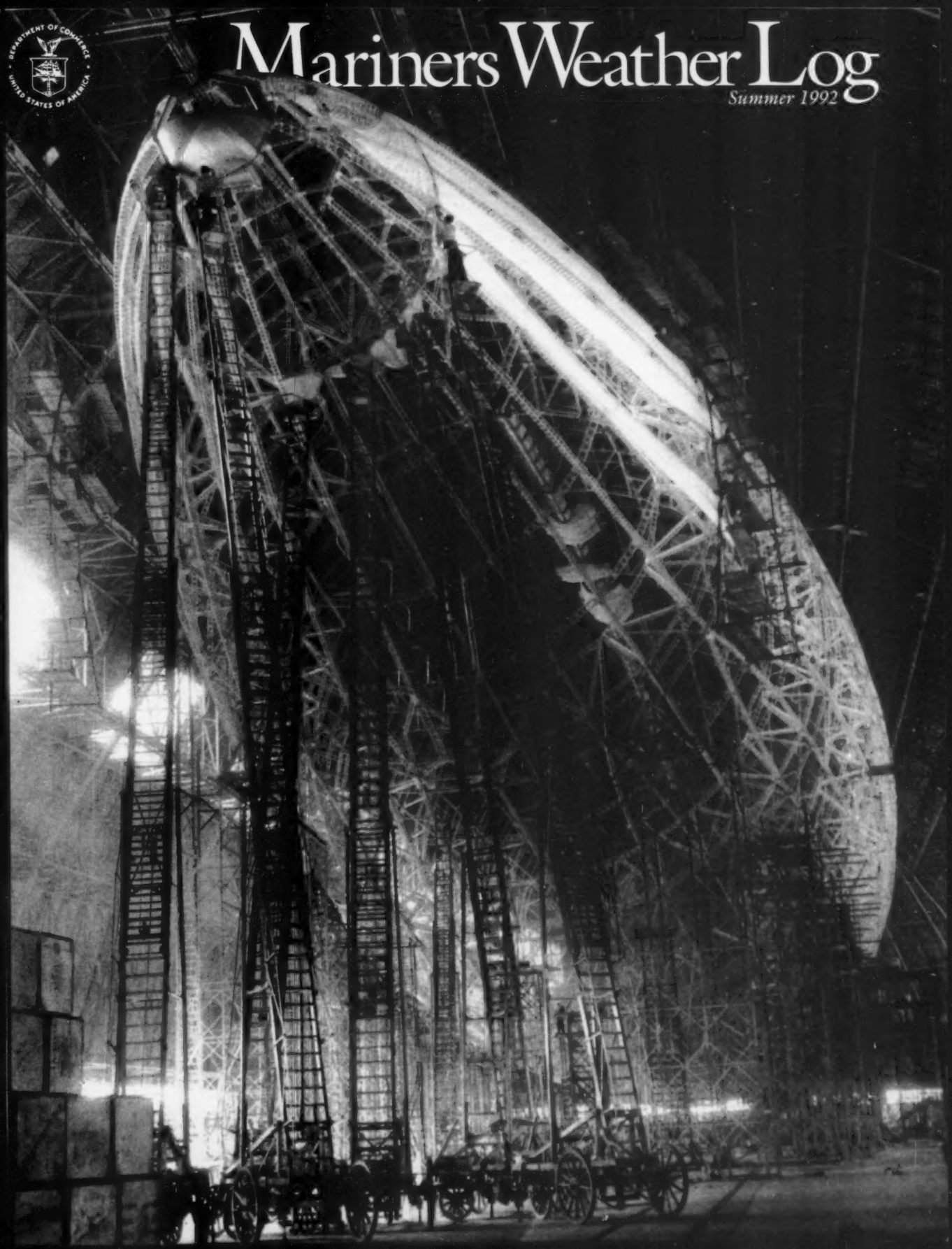
Mariners Weather Log

Summer 1992



Fairport Harbor Lighthouse

Lake Erie
Fairport, Ohio

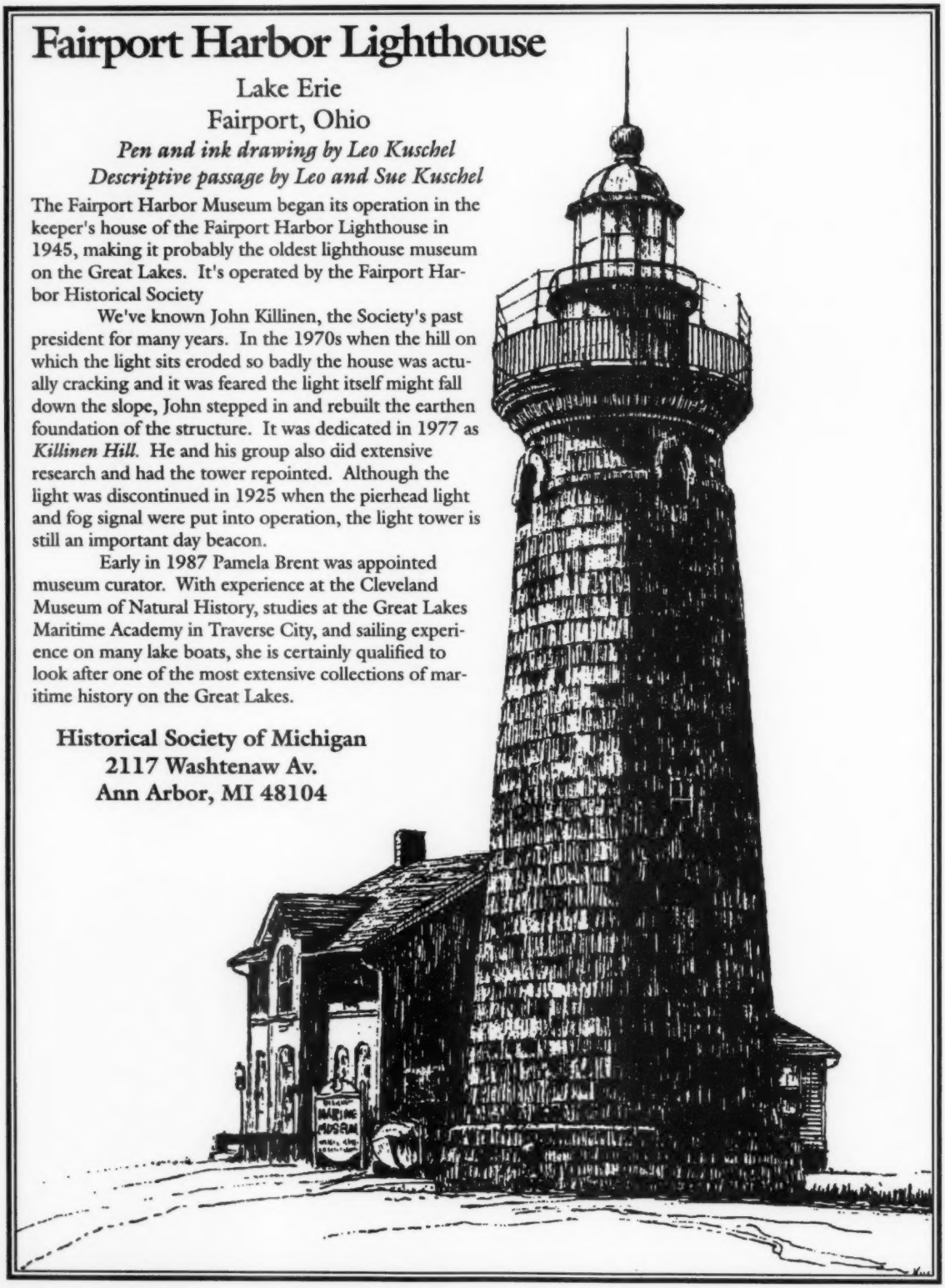
Pen and ink drawing by Leo Kuschel
Descriptive passage by Leo and Sue Kuschel

The Fairport Harbor Museum began its operation in the keeper's house of the Fairport Harbor Lighthouse in 1945, making it probably the oldest lighthouse museum on the Great Lakes. It's operated by the Fairport Harbor Historical Society

We've known John Killinen, the Society's past president for many years. In the 1970s when the hill on which the light sits eroded so badly the house was actually cracking and it was feared the light itself might fall down the slope, John stepped in and rebuilt the earthen foundation of the structure. It was dedicated in 1977 as *Killinen Hill*. He and his group also did extensive research and had the tower repointed. Although the light was discontinued in 1925 when the pierhead light and fog signal were put into operation, the light tower is still an important day beacon.

Early in 1987 Pamela Brent was appointed museum curator. With experience at the Cleveland Museum of Natural History, studies at the Great Lakes Maritime Academy in Traverse City, and sailing experience on many lake boats, she is certainly qualified to look after one of the most extensive collections of maritime history on the Great Lakes.

Historical Society of Michigan
2117 Washtenaw Av.
Ann Arbor, MI 48104



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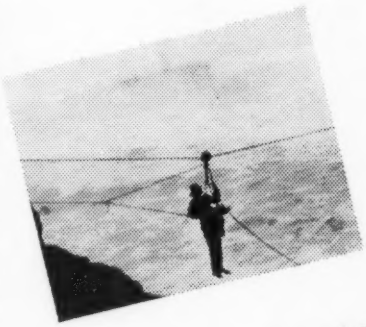

They battled the elements to rescue ships in distress. Story on page 14.

Rick Booth, editor of the ***First Word***, has the last word on the Halloween Storm.

Cover: The USS *Macon* now resides in NOAA's newest sanctuary—Monterey Bay Marine Sanctuary. She was built Akron, Ohio where workers atop ladders wrapped cotton–cloth skin around the stern in 1932. This wonderful photograph was kindly provided by Hepburn Walker Jr. of Vero Beach, Florida. Story on page 44.

Back Cover: The Chicamacomico Life–Saving Station was established in 1874, and was one of the first seven stations on the Outer Banks of North Carolina. These buildings survive as one of the most complete U.S. Life–Saving Service/Coast Guard Station complexes on the Atlantic Coast. The photograph by Michael Halminski in 1974, was provided by the Chicamacomico Historical Association. Story on page 40.

Paul Bradley's view of Fire Island Lighthouse— Page 36.

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Mariners Weather Log

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The Secretary of Commerce has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through July 1, 1993.

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Articles, photographs and letters should be sent to:

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1825 Conn. Av., NW
Washington DC 20235.

From the Editor

Recently, we have run a number articles and columns featuring the U.S. Coast Guard. Some have suggested we might change our name to the *Mariners Coast Guard Log*. In our defense, cooperation between the U.S. Coast Guard and NOAA goes back a long way— actually before either the Coast Guard or the Weather Bureau formally existed. Today the two services are closer than ever. Weather, oceanography, navigation, communication, and enforcement are some of the fields in which NOAA and the Coast Guard assist one another on a daily basis. Many Coast Guard rescues are weather–related and most lighthouses are located where there are weather or oceanographic related navigational hazards.

In this issue, for example, there is Rick Booth's dramatic account of a few days in the life of a Coast Guard cutter, during the Halloween Storm, and Elinor De Wire's story about the old Life–Saving Service. Both stories are intimately connected with weather as well as the Coast Guard.

The history of the Life–Saving Service is a treasure trove of weather–related stories of heroes of the past. Some of the old Life–Saving Stations have been or are in the process of being saved. Most are long gone. We are fortunate enough to have Elinor De Wire volunteer to do a column about some of these stations, bringing to life their past as only she can do.

In addition, we have added another columnist— E. B. *Skip* Gillham, who will write about weather–related shipwrecks on the Great Lakes. Skip, a school teacher in Vineland, Ontario, is a marine history buff who has had 12 books published, and was recently honored for his 1,000th shipping column in the St. Catharines Standard.

In addition, we have been able to add an assistant editor to our staff— Nancy O'Donnell. Nancy brings her English expertise, which is badly needed, and has already contributed significantly to the Log. With two new columns and a series on NOAA's Marine Sanctuaries, this is looks like an exciting year for the *Mariners Weather Log*.

As usual, we are always looking for contributions from the Merchant Mariners. It is their experiences, along with their observations that drive the marine weather and climate program. The Mariners Weather Log is first and foremost their magazine and we will continue to feature the things that interest them. Finally, the most asked question from mariners has been: Where have all the Pilot Charts gone? The answer is on the following page.

Where are the Pilot Charts?

Howard Cohen
Defense Mapping Agency

Just as the tides change the seashore, a longtime Defense Mapping Agency (DMA) publishing tradition has changed. The *Quarterly Pilot Charts of the North Atlantic and North Pacific* will be replaced by two new publications: an *Atlas of Pilot Charts North Atlantic Ocean* and an *Atlas of Pilot Charts, North Pacific Ocean*. These will be added to the other existing Pilot Chart atlases to bring the total to five:

NVPUB 105: Atlas of Pilot Chart South Atlantic Ocean
NVPUB 106: Atlas of Pilot Charts North Atlantic Ocean
NVPUB 107: Atlas of Pilot Charts South Pacific Ocean
NVPUB 108: Atlas of Pilot Charts North Pacific Ocean
NVPUB 109: Atlas of Pilot Charts Indian Ocean

A 10-year cycle of updating these atlases has been developed. The traditional Pilot Chart article on the reverse side of the quarterly charts will also appear in each atlas.

The first Pilot Chart was created by Matthew Fontaine Maury in 1847. Known as *Maury's Wind and Current Charts*, it portrayed the average wind and currents for each five degree square of the navigable oceans. These averages helped mariners determine the best route for a particular voyage. During the *Great Clipper Ship Era*, this information saved millions of dollars per year.

The *Wind and Current Charts* reduced passage time from the East Coast of the United States to California from 183 to 135 days. A round trip voyage from England to Australia that normally took 250 days could now be completed in 160 days.

News of the *Wind and Current Charts* spread from port to port, and they were soon in great demand. In March 1885 a new feature was introduced on the back of the Pilot Chart– an article of interest to the mariner. The first article was *Waves in Motion*. Pilot Chart articles on weather and timely information continued until World War I, when they were augmented with U-boat sightings and ship sinking information. Other wartime articles featured moonlight diagrams, wartime Notice to Mariners, special warnings, mine information, and wreckage sightings.

Over the years specialized Pilot Charts were produced, such as Pilot Charts of the Upper Air, Pilot Chart of the Northern Atlantic, and Pilot Chart of Greenland and the Bering Sea. During its peak the monthly Pilot Chart was assigned to the Pilot Chart's Branch with a full time staff of seven people. The Pilot Chart Branch has now disappeared along with the monthly and quarterly Pilot Charts. The new Pilot Chart atlases are just one of many navigational products published by the Mapping and Charting Department. Pilot Chart subscribers long accustomed to quarterly deliveries may have difficulty in adjusting to a 10-year cycle, but however infrequent, the Pilot Chart will remain a maritime tradition.

Atlas of Pilot Charts North Atlantic Ocean

(Available October 1992, $6.25)

From:
DMA Combat Support Center
ATTN: PMS, Mail Stop D-16
6001 MacArthur Blvd.
Bethesda, MD 20816-5001

The Observation

Joseph M. Sienkiewicz

It was obvious to the forecasters at NOAA's National Meteorological Center (NMC) that a major storm was brewing off the East Coast of North America. The question–just how deep was it going to get?

The answer came from the ***Margaret Lykes*** in the form of a 977.0–millibar pressure report, just east of the low's center–a low that would become known as the Halloween Storm of 1991.

With the aid of this single ship observation, it became clear that an historic event was unfolding. On the 30th of October 1991, the Low was analyzed at 972 millibars–some 14 millibars lower than it was on the 0900 UTC North American Surface Analysis just 3 hours before. This resulted in a 44–millibar pressure gradient between the Low center and Yarmouth, Nova Scotia.

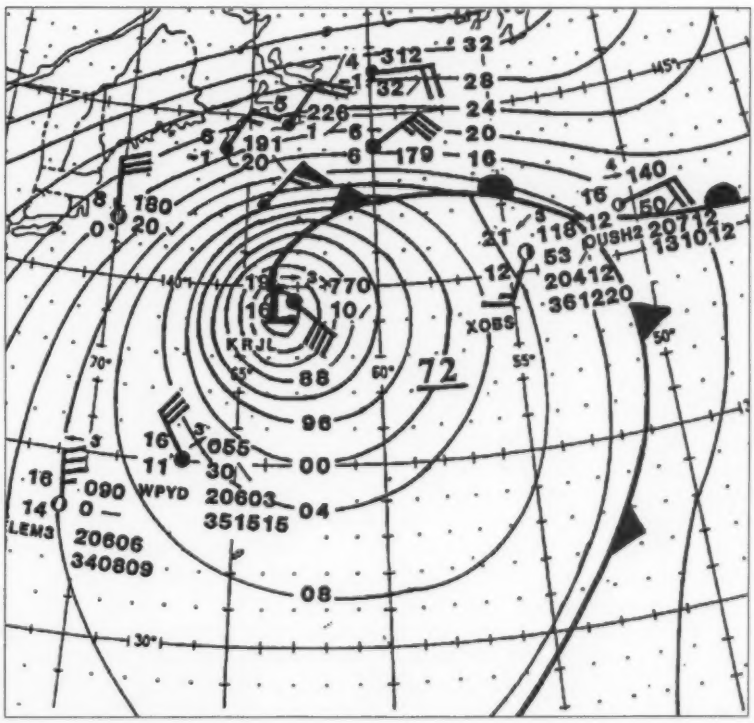
The impact of the ***Margaret Lykes*** observation was dicussed by the high seas forecaster at NMC and the marine forecasters in Washington and Boston. By revealing the ultimate strength of the storm the observation enabled these forecasters to issue warnings and local forecasts that in all probability saved property and lives.

The Halloween Storm caused extensive coastal flooding and wave damage from the coast of Maine to the Outer Banks of North Carolina. At sea, conditions were horrendous with sustained winds reaching 75 knots and seas to 50 feet. A Canadian buoy (44137) reported a significant wave height of 56 feet and a peak wave of 99.8 feet at 0500 UTC on the 30th of October.

For over a year now High Seas Forecasters at the National Meteorological Center have met regularly with ship Masters and Mates at the Marine Institute of Technology and Graduate Studies (MITAGS) just outside of Baltimore, Maryland. These meetings consist of a review of current marine products issued by NMC and a discussion between forecaster and user of how these products can be improved. Changes to the radiofacsimile program for the North Pacific have been the direct result of these discussions. One question that does come up upon occasion is, "Do you use our weather observations?" The answer is a most definite YES.

Margaret Lykes

The Halloween Storm of 1991 (left) was an unusual one in many ways. Its track, meteorological make-up and sudden intensification caused plenty of headaches for forecasters. It also presented problems for the U.S. Coast Guard as well. This is detailed on page 22 of this issue. The most significant erosion and wave damage occurred along the New England and eastern Long Island coasts, with high tide approximately 6 to 12 hours after the ***Margaret Lykes*** *observation. The depiction of the Northern Hemisphere Surface Analysis (right) shows the storm at 1200 UTC on October 30, 1991. The* ***Margaret Lykes*** *(call sign KRJL) is just to the east of the center.*



Joseph M. Sienkiewicz is a High Seas Forecaster at NOAA's National Meteorological Center.

Flagged by QUIPS

Surface ship observations are one of several different types of ocean data analyzed and used in the various NMC computer forecast models. Others include ship-launched radiosonde data, satellite-derived wind and moisture data, and jet stream level aircraft- derived wind and temperature data.

Surface ship data are the basis for determining initial conditions for the forecast models and, consequently, the resulting forecasts. For this reason the National Ocean Service (NOS) quality controls the ship data at NMC. These meteorologists perform round-the-clock monitoring of ship data using a sophisticated computer system called QUIPS. This computer system compares several observed parameters (pressure, temperature, wind speed and direction, and sea surface temperature) with the computer model fields. The goal is to provide an optimum data base of surface ship observations for the computer analysis process. QUIPS denotes or flags data that are significantly different from the computer model fields. Each of these observations is then inspected by an NOS meteorologist. This is all done on a computer graphics screen with a window that allows the meteorologist to look at the ship observation in question, the computer model fields, additional data in the vicinity of the ship, and the ship's track history all at the same time. This aids greatly in quality controlling the ship data.

QUIPS also stores a 10-day history of observations for each ship and a list of the differences between the observed parameters and the model fields. If, for example, a ship over a 10-day period has a 5 to 7 millibar average difference in sea-level pressure from the model field, then it can be assumed that the ships' barometer needs to be corrected. Approximately, 10% of all ship sea-level pressure observations are flagged by QUIPS. Flagged parameters are either rejected, accepted or corrected.

NOS meteorologists use satellite imagery to help determine if the computer field is consistent with the imagery. QUIPS only compares the observations with

model parameters. Therefore, if the model is poor, as it might be with a developing storm, it is possible that many ships in that vicinity would be flagged, indicating that the model may be incorrect.

QUIPS can also reconstruct a track for a given vessel, which is particularly helpful in correcting the location of a ship. Recently, an eastbound ship from the Far East crossed the dateline and forgot to change her reported quadrant. Her track turned westward although her reported course continued to be easterly. Since her observations were consistent with conditions east of the dateline, the error was easily corrected. Prior to manual quality control, this observation would have been flagged by the computer and rejected automatically for inconsistency. Now, before a flagged observation is rejected, the meteorologist examines the ship's track and observation history, and checks for consistency against other observations in the area. Lastly, current satellite imagery is examined to ensure that the observation agrees with the overall synoptic situation.

Ship data undergo quality control prior to being used in the various computer models and for the Northern Hemisphere Analysis. The Surface Analysis Team regularly consults with the NOS meteorologist to determine whether a given ship observation looks correct.

Finally, NOS meteorologists compile a list of all buoy and ship data for each ocean and it is used by the NMC High Seas Forecasters. The cutoff time for this list is approximately 2 hours 30 minutes after the observation time. This list for the forecasters contains more data than the Northern Hemisphere Surface Chart with its data cutoff time of 1 hour 40 minutes.

For example, during the 1991 Halloween Storm two ships reported combined seas between 40 and 45 feet just east of Georges Bank at 1200 UTC on the 29th of October. Neither of these observations were in time for the Northern Hemisphere Surface Chart but made the final list of ships and buoys in time for the forecast, so initial conditions for the area north and west of the storm center were increased to **WINDS 50 TO 75 KT SEAS 35 TO 50 FT**. These observations were also passed on and used by the Weather Service Forecast Office (WSFO) in Boston.

North American Surface Analysis

The Surface Analysis Team of the Meteorological Operations Division produces eight North American Charts (every 3 hours) and four Northern Hemisphere Surface

Uniphoto

Analyses (every 6 hours) per day.

The North American Surface Chart consists of a computer-drawn surface pressure field with a manual analysis of low and high pressure centers and fronts.

Two data cutoff times are used for the North American Surface Chart analysis. The first occurs at 30 minutes past the observing time (for a 0000 UTC map all data received prior to 0030 UTC are plotted on the preliminary map). The analyst begins the frontal analysis on an acetate overlay. Surface data continues to be collected and a second base map is produced using a data cutoff of 10 minutes later. Most of these additional data are ship observations. The analysis is completed on the acetate and is then traced in pencil onto a second base map and transmitted via various facsimile networks throughout North America. The North American Surface Analyses are used by both the private and public meteorological communities.

Northern Hemisphere Analysis

The completed North American Analysis is then used over North America as the basis for the Northern Hemisphere Charts at 0000, 0600, 1200, and 1800 UTC. This is strictly a manual analysis and determines the strength of low and high pressure systems and fronts, with special emphasis over the oceans.

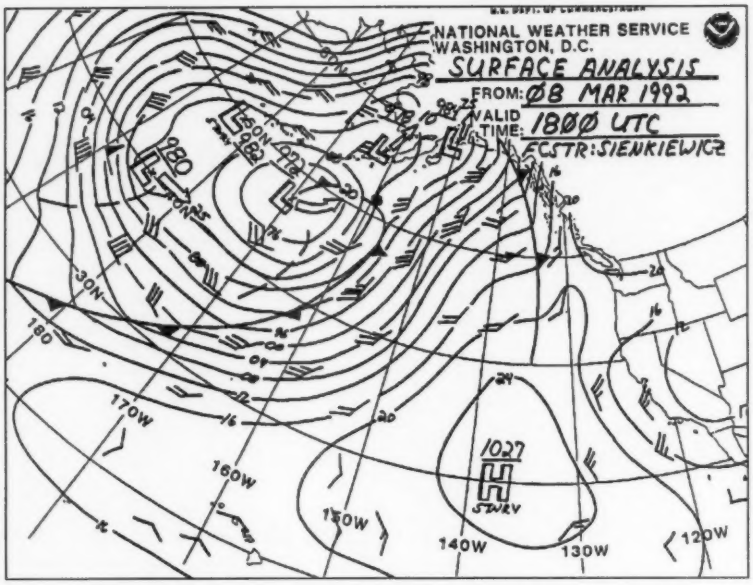
The data cutoff times for these analyses are 1 hour 30 minutes and 1 hour 40 minutes after the synoptic observing time. Once the preliminary base map is plotted, the surface analysts are briefed by a meteorologist from the Synoptic Analysis Branch of the National Environmental Satellite Data Information Service (NESDIS) as to the location of fronts and low centers over the oceans as estimated from satellite imagery. An acetate overlay is placed over the base map with the estimated positions of fronts and low centers. This interpretation of satellite imagery serves as a first guess for the surface analyst as to the location of significant features.

The two analysts then have approximately 1 hour to complete the analysis for the entire Northern Hemisphere. They ana-

Data Cutoff Times at NMC

(Data received prior to these times would be used in the analysis or forecast process.)

Product	Valid Time (UTC)	Cutoff Time (UTC)	NMC Release Time (UTC)	
North American Surface Chart	0000	0040	0130	
	0300	0340	0430	
	0600	0640	0730	
	0900	0940	1030	
	1200	1240	1330	
	1500	1540	1630	
	1800	1840	1930	
	2100	2140	2230	
Northern Hemisphere Surface Chart	0000	0140	0300	
	0600	0740	0900	
	1200	1340	1500	
	1800	1940	2100	
High Seas Forecast			Pacific	Atlantic
	0000	0230	0430	0500
	0600	0830	1030	1100
	1200	1430	1630	1700
	1800	2030	2230	2300



This North Pacific Surface Analysis, valid at 1800 UTC on the 8th of March 1992, was prepared for radiofacsimile transmission. Movements of the significant features is indicated with an arrow. The wind values shown are either measured from the pressure gradient or taken directly from ship and buoy observations.

lyze the pressure field and adjust the position of significant features according to the satellite estimates and available ship observations.

It is possible, due to the availability of more data, particularly over the oceans, for the Northern Hemisphere Analysis to disagree with the North American Analysis concerning specific features. Upon completion, the Northern Hemisphere Analysis is transmitted over the facsimile networks in two parts centered over the Pacific and Atlantic Oceans. These are also distributed to various forecasters within NMC, including the Atlantic and Pacific High Seas Forecasters.

High Seas Forecast (Text)

Upon receipt of the Northern Hemisphere Surface Chart, the Atlantic and Pacific High Seas Forecasters begin writing the High Seas Warning and Forecasts. They issue warnings and forecasts every 6 hours for the North Atlantic (north of 32°N and west of 35°W) and for the North Pacific (east of 160°E between 30°N and a line from 50°N 160°E to the Bering Strait). Initial conditions of wind and sea given in the High Seas Forecasts are taken directly from the Northern Hemisphere Surface Analysis. The forecasters use all available ship data and they also consult regularly with the NOS meteorologists regarding specific ship observations.

In the High Seas Forecast text low pressure centers are classified for warning purposes as STORM (associated winds 48 knots or greater) and GALE (winds 34 to 47 knots), while lows with winds less than 34 knots are simply classified as LOW and are described in the SYNOPSIS AND FORECAST portion. In addition to initial conditions, a 36 hour forecast position, category (STORM, GALE, or LOW) and forecast wind and sea are given with each low pressure center. Pertinent areas of wind and sea conditions are not always associated with low pressure systems and are commonly described as associated with a front or simply as an area.

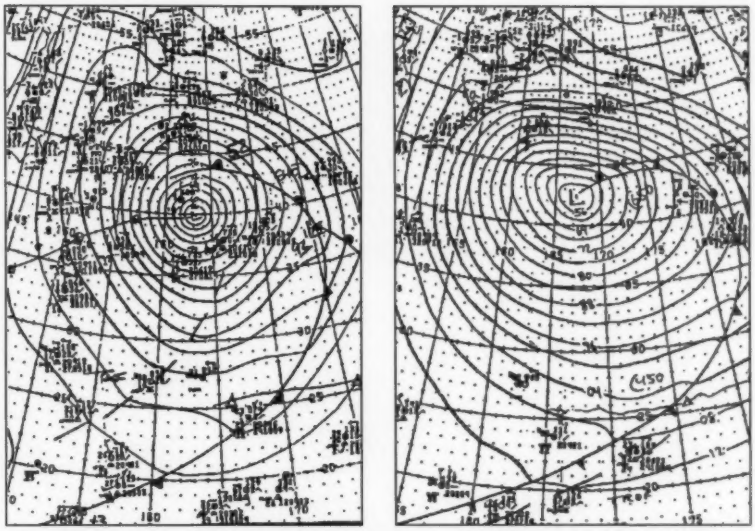
The final list of all available ship and buoy data, which is compiled 2 hours 30 minutes after the observation time, may result in the High Seas Forecast initial conditions differing somewhat from the Northern Hemisphere Analysis.

The High Seas Forecasts for the areas south of 32°N in the Atlantic and 30°N (east of 140°W) in the Pacific are prepared by the National Hurricane Center in Coral Gables, FL. These are added to that portion completed at NMC and are transmitted for broadcast approximately 4 hours 30 minutes after synoptic time for the Pacific and 5 hours after synoptic time for the Atlantic. These forecasts are then broadcast (voice, CW and SITOR) by the United States Coast Guard Radio Stations at Point Reyes, California (NMC) and Marshfield, Massachusetts (NMF).

High Seas Forecast (Charts)

In addition to the written forecasts, a suite of graphic analyses and forecasts are prepared daily by the High Seas Forecasters for the North Pacific and transmitted by the USCG at Point Reyes, California (NMC). The National Meteorological Center has no radiofacsimile program for the North Atlantic, although, the NWS Forecast Office (WSFO) Boston does operate a regional radiofacsimile program using the USCG transmitter at Marshfield, Massachusetts (NMF).

The Pacific radiofacsimile program consists of: three surface analyses per day (0000, 1200, and 1800 UTC), two tropical analyses (prepared by NHC at 1200 and 1800 UTC), a sea state analysis of significant wave height and direction of propagation (0000 UTC),



These NMC Northern Hemisphere Surface Analyses are for February 26, 1992 at 0000 (above,left) and 1200 UTC. Significantly more ship observations were available at 0000 UTC than at 1200 UTC, particularly south and west of the Low center.

two 36-hour surface forecasts (valid 0000 and 1200 UTC), a 36-hour sea state forecast (valid 0000 UTC), an 84-hour surface extended forecast (valid 0000 UTC), several oceanographic analyses, and satellite pictures. The surface and sea state analyses are prepared using all available ship observations.

The surface analyses are essentially retraced versions of the NMC Northern Hemisphere Surface Analyses with inclusion of the predominant wind direction and speed along with the speed and direction of movement of significant weather features. However, this chart is prepared after the High Seas Forecaster has examined all ship observations, so it is possible that this analysis may differ somewhat from the NMC Northern Hemispheric Analysis.

The wind barbs shown are estimated from measuring the pressure gradient or are observed winds from ships and buoys. In conversations with Masters and Mates at MITAGS it has been suggested that a distinction be made on these analyses between observed and measured winds.

Diurnal Variations

The total number of ship observations available for the North Pacific and North Atlantic varies greatly with the synoptic reporting time. Each day the largest number of ship observations are received at 0000 UTC from the central and western North Pacific, and 1800 UTC in the eastern North Pacific, while 1200 UTC generally has the smallest number. It is common for an entire Pacific low pressure system to not have a single observation near it for several successive maps, or occasionally, for even a day or two.

Similar diurnal variations occur in the North Atlantic, where 1200 UTC observations are often plentiful while 0000 and 0600 UTC data are often sparse. It is assumed that this variation is due to radio operators working primarily daylight hours.

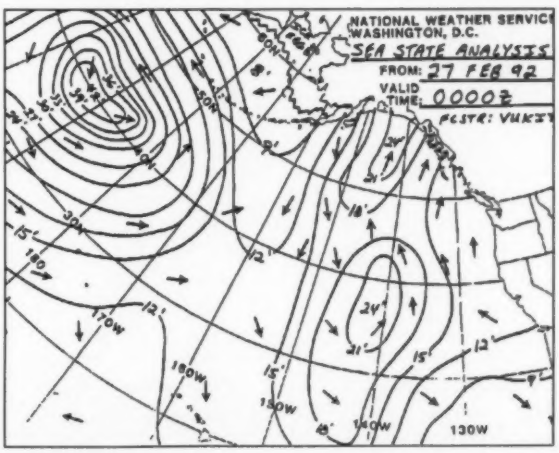
To take advantage of the most observations, the sea state analysis for the North Pacific is prepared using 0000 UTC data. The combined sea or significant wave height (SWH) is determined by the formula:

$$SWH = ((WWH)^2 + (SH)^2)^{1/2}$$

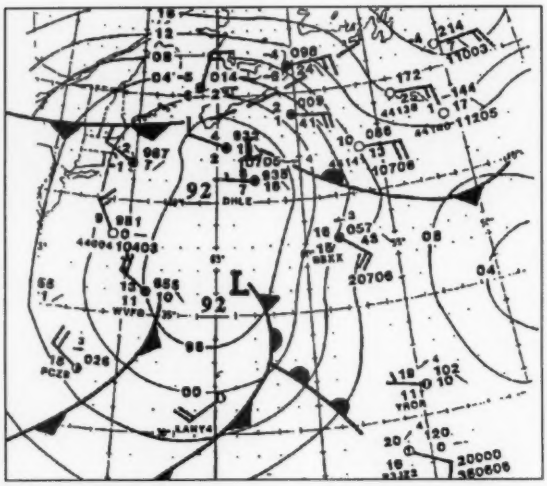
Where:

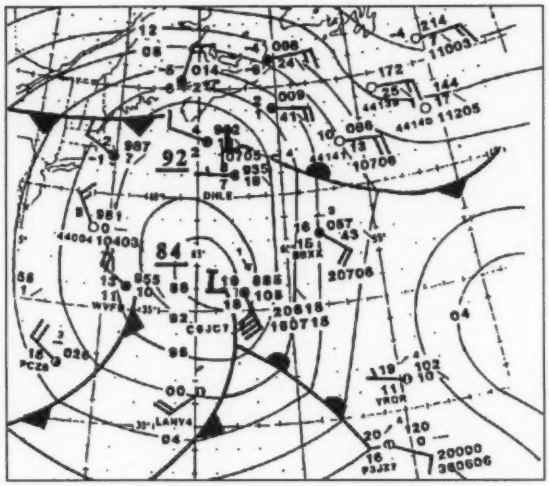
WWH = wind wave height
SH = swell height
SWH = significant wave height

This information is obtained directly from ship and buoy observations and plotted by hand on a copy of the base map for the Northern Hemisphere Surface Analysis. The significant wave height is then contoured in 3-foot increments. To assist in data sparse regions, 12-hour forecasts



North Pacific Sea State Analysis for February 27, 1992 shows contours (every 3 feet) of significant wave height. The arrows show the direction toward which the primary swell is moving.





Depictions of the North American Surface Analysis (above,left) and the Northern Hemisphere Surface Analysis (above,right) for 0000 UTC on February 1, 1992. The 988.5 millibar pressure reported by the ***Chiquita Cincinnatian*** *resulted in an improved analysis on the Northern Hemisphere chart, which was prepared using data that was received after the original analysis was made. The ship's course is shown by an arrow at the top of the observation and speed is indicated by a coded number (0–9) also above the observation (a 1 indicating a speed made good of only 1–5 knots is shown in this example).*

of significant wave height valid at 0000 UTC from the Navy Global Spectral Ocean Wave Model (GSOWM) and from the NOAA Ocean Wave (NOW) Model are used as references.

Using Ship Observations

The following is an example of how a ship observation played an important role in determining the intensity of a Low. On February 1, 1992, a fairly complex surface situation existed along 65°W with one low center just south of Nova Scotia and a second near 37°N. Forecasters were trying to determine which low center would become the dominant one. This was pertinent not only to marine forecasters but also for forecasters in the Maritimes and New England, since the potential for heavy snowfall existed.

The 0000 UTC February 1 North American Surface Analysis (above, left) shows very little ship data in the vicinity of the southern low center. Satellite imagery indicated that this low was strengthening. Based on available information it was analyzed at 992 millibars. This represents a fairly typical dilemma in the analysis process. A low is strengthening as indicated by satellite imagery, yet with a lack of ground truth the analyst must estimate by how much.

The Northern Hemisphere Surface Chart (above,right), with its later data cutoff time, showed the ship ***Chiquita Cincinnatian*** just to the east of the low center with an observed pressure of 988.5 millibars and winds from the south southeast at 40 knots. Clearly, the Low was deeper than the initial 992 millibars on the North American Analysis and was re-analyzed at 984 millibars.

This ship observation made a significant difference in the analysis. It clearly indicated to forecasters which low would become dominant. Previous forecasts and discussions focused on the northern Low. The southern Low was upgraded from a GALE to a minimal STORM with winds to 50 knots within 450 NM OVER SE QUADRANT. This report also aided public forecasters in the Maritimes and New England. The southern Low moved northward merging with the northern center and became a blizzard, dumping nearly 65 inches of snow in Moncton, New Brunswick.

Several aspects of this observation were extremely useful to both the analysts and high seas forecasters. The reported pressure change of a fall of 10.5 millibars over the past 3 hours was consistent with the satellite imagery indicating rapid intensification. Surface analysts routinely use the observed 3-hour pressure change at land stations to aid in locating fronts and determining if a low may be developing. At sea this is much more complicated, since the combined motion of the observing ship and weather system must be considered. A large pressure fall observed by a ship may be due to the relative motion between ship and the front or low and may not be indicative of intensification. In this example the ***Chiquita Cincinnatian*** (C6JC7) reported a movement of only 1 to 5 knots to the south, which suggested

Ship Observation Summary

Your ship weather observations are used operationally at the National Meteorological Center and

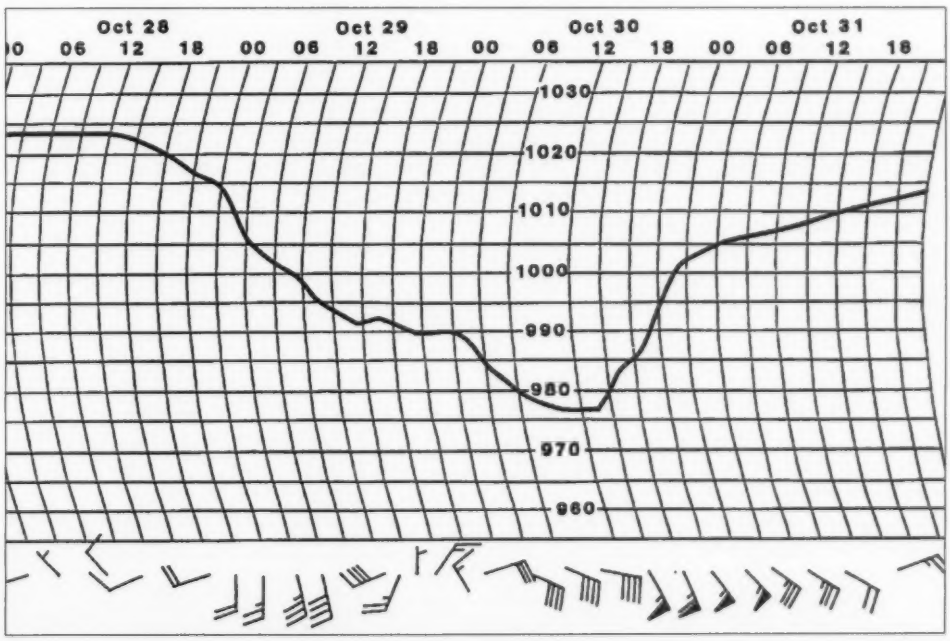
- They are used to determine the initial conditions for the computer forecast models.
- They have a direct impact on the quality of the computer model forecasts by being input data to determine the initial conditions.
- They are the chief source of surface data available over the oceans and thus impact greatly the NMC North American and Northern Hemisphere Surface Analyses.
- They and the resulting surface analyses are the primary means used to determine the initial warnings of wind and sea conditions given in High Seas and Offshore Marine Forecasts.
- They are the primary data used in determining both the surface analyses and sea state analyses for the North Pacific radiofacsimile broadcast by the USCG at Point Reyes, California (NMC).
- They are archived (this includes those that are mailed in) at the National Climatic Data Center (NCDC) in Asheville, North Carolina and are used in meteorological research including climatological studies and case studies of specific events.

that the bulk of the 10.5-mb pressure fall was due to rapid intensification of the low.

Lastly, ***Chiquita Cincinnatian*** reported a wind wave (20615) of 15 half meters (25 feet) with a 6 second period and a primary swell group (160715) of 15 half meters (25 feet) with a 7 second period from the south southeast. This would yield a significant wave height of nearly 33 feet. It is unclear in this example, with the period and height of wind wave and swell being so similar, if indeed the two are one in the same. Regardless, whether the significant wave height was 25 or 33 feet, this ship had a significant head sea and the reported speed is consistent with the given sea conditions.

In examining ship observations, operational meteorologists look for consistency in the reported parameters. Every aspect of this observation is consistent, sea state with reported speed and course, pressure change with speed made good and with the intensification in the satellite imagery, and pressure with pressure change.

In the previous example it was shown that the entire observation was consistent with itself and the satellite imagery. In the Halloween Storm, the ***Margaret Lykes*** pressure tendency and change were inconsistent with the reported course and speed of the vessel (11 to 15 knots to the east). If indeed, this was the case, the ***Margaret Lykes*** would have just gone through the center of the storm and should have initially had an immense fall in pressure and then



The barograph trace along with the observed winds were recreated from the smooth log of the ***Margaret Lykes****, which was westbound enroute to New York when it passed through the cold front at approximately 1500 UTC on the 29th. It remained in close proximity to the strengthening Low until 1400 UTC on the 30th, when the storm accelerated to the west outrunning the ship, as indicated by the sharp pressure rise and storm to hurricane force winds.*

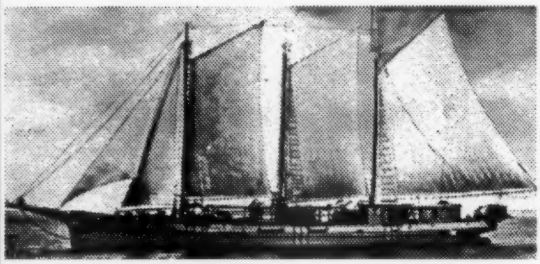
a slight rise. This was discussed by the high seas forecaster and surface analyst while the Northern Hemisphere Chart was being analyzed. It was agreed that the ***Margaret Lykes*** observation was correct except for the pressure change and tendency group. Several weeks later it was determined that, in fact, the ***Margaret Lykes*** was westbound. Suddenly the 1.0-millibar rise in pressure made sense, since the ship was travelling with the storm center and the slight rise in pressure was due to the storm outrunning the ***Margaret Lykes***.

Your ship observations make a difference in the quality and accuracy of marine warnings and forecasts issued by NMC. The forecasters recognize the diligence and appreciate the efforts of ship deck officers in providing high quality observations.

Questions or comments regarding the North Pacific and North Atlantic High Seas Forecasts or North Pacific radiofacsimile program should be sent to:

Satellite and Marine Section
National Meteorological Center
World Weather Building, Room 410
Washington, DC 20233

LYKES LINES



Doctor Lykes

For years Lykes Lines has been a leader in world ocean transportation and a willing participant in the Voluntary Observing Ship Program. Lykes Brothers traces it roots back to 1900, when two of the seven sons of Dr. Howell Tyson Lykes, began shipping cattle to Cuba in a 109-foot schooner, the ***Doctor Lykes***. This venture began shortly after the Spanish-American War, which had wiped out Cuba's cattle herds. They opened an office in Havana and began importing cattle, developing ranches and processing beef. In 1903 they opened an office in Galveston and 3 years later the brothers made the jump from shipping family steers to shipping general cargo between the western Gulf of Mexico and Caribbean ports. By 1910, the remaining brothers had joined the family enterprise.

With U.S. entry into WWI, Lykes Brothers cooperated with the U.S. effort to build a strong merchant marine and by 1917 became the first Gulf operator to charter and operate U.S. government ships, as a U.S.-flag carrier. By 1920, the company operated 15 chartered ships and in 1922 purchased its first vessels— five war-built U.S.-flag vessels.

After moving its headquarters from Galveston to New Orleans, Lykes Brothers Steamship Co., Inc. began to range beyond the Gulf of Mexico and the Caribbean. By the mid 1930s, Lykes trade routes extended from the Gulf of Mexico to the United Kingdom, northern Europe, the Mediterranean and the Far East as well as the Caribbean and the coastal U.S.

Lykes handled 60 million tons of cargo during WWII and, at the peak of the fighting, they operated 125 cargo ships of all types. Twenty-two Lykes ships were sunk during the war at a cost of 272 lives. By 1947, Lykes operated 145 vessels— 47 of its own and 98 under charter. After the war, they added the west coast of South America to their trade routes. In 1947, they merged with the Grace Lines and became known as the Gulf and South American Steamship Company. This lasted until 1971, when Lykes purchased Grace's interest. By the 1950s, with a fleet of 54 ships, Lykes was the largest U.S. flag cargo fleet under private ownership. In 1978, Lykes Corp. merged with LTV Corp. and the steamship company continues as a subsidiary of LTV. Lykes participated in an historic event on March 18, 1979 when the S.S ***Letitia Lykes*** became the first U.S.-flag vessel to call in a Chinese port since the communist revolution in 1949. That same year (1979), Lykes expanded its operation to the West Coast of the U.S.

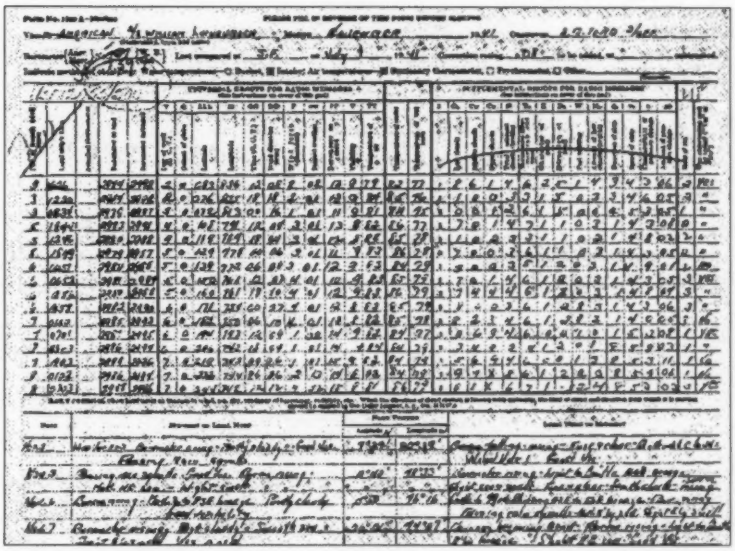
A new chapter began in 1983 when the Interocean Steamship Corp. purchased Lykes Brothers Steamship Co., Inc. However, stockholders of this Florida-based company included descendants of the original seven Lykes brothers and senior executives of Lykes Steamship Co.

WANTED DEAD OR ALIVE

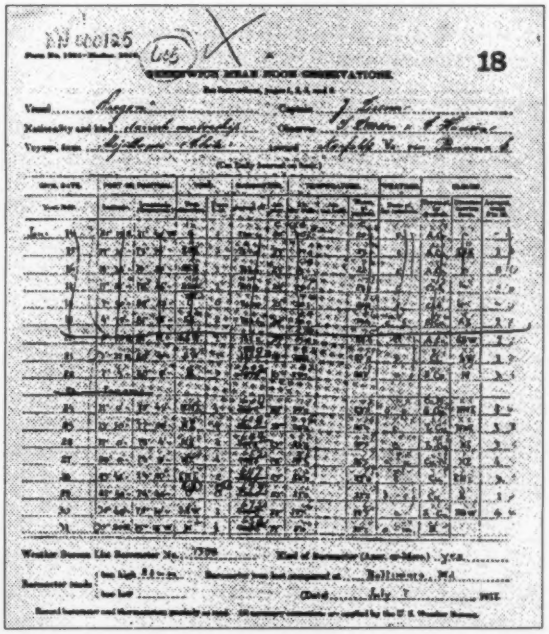
Hourly AKA Daily, AKA Synoptic

These U.S. Merchant Marine observation forms from the 1940s go by three names: **daily** *(one observation per day);* **synoptic** *(generally two observations per day);* **hourly** *(generally 3 to 5 observations per day). Daily is by far the most likely to be seen. Daily forms record only the Greenwich Mean noon observation each day. This requirement was established in order to produce one large-scale synoptic chart per day.*

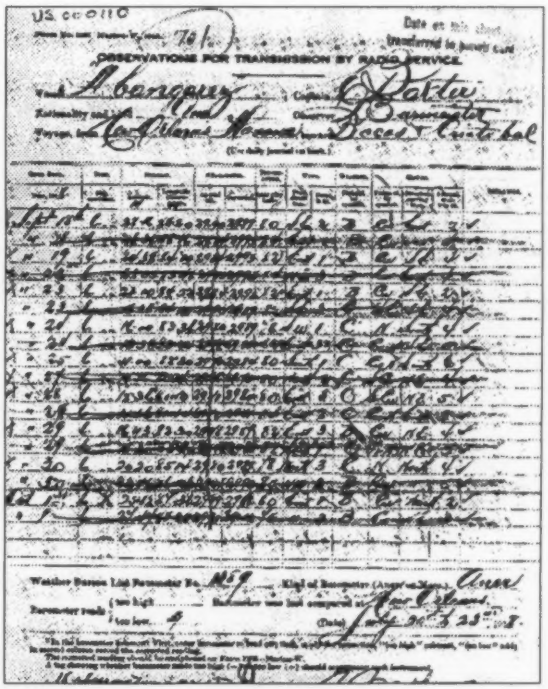
If the whereabouts of any of these forms is known please call Joe Elms at 704-259-0344 or write National Climatic Data Center Federal Building Asheville, NC 28801



Hourly



ALIAS Daily



ALIAS Synoptic

"Greater love hath no man than this, that a man lay down his life for his friends."

SAVERS OF LIVES

ELINOR DE WIRE

Elinor De Wire has written nearly 200 articles on a wide variety of subjects for ***American History Illustrated, Sea Frontiers, Americana, Hawaii, The Compass*** *and* ***Offshore*** *magazines among others. Her first love is lighthouses, and she has traveled extensively to research and photograph this subject. She has entertained Log readers since 1987. The June/July 1992 issue of Weatherwise features Elinor's "Feline Forecasters" and this year she was awarded the 1992 National League of American Pen Women prize for short fiction for her story "The Lei" set in Hawaii. Elinor is working and teaching at Mystic Seaport Museum in Mystic, Connecticut, and currently developing a large exhibit on the History of Navigation, which will open this fall. She has recently finished a book about lightkeepers. Her book* ***Guide to Florida Lighthouses*** *is already in print.*

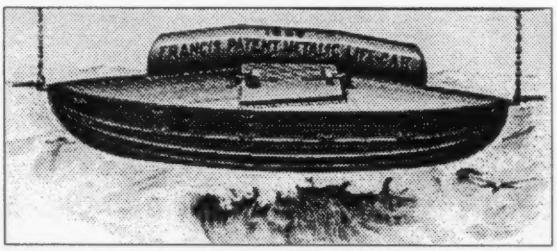
Elinor lives in Gales Ferry, CT with her husband Jon, a Navy officer, and their children Jessica, a University of Connecticut music major, and Scott, who will be attending Ledyard High School. Jessica is an excellent artist and has provided us with several sketches for use in our column headings.

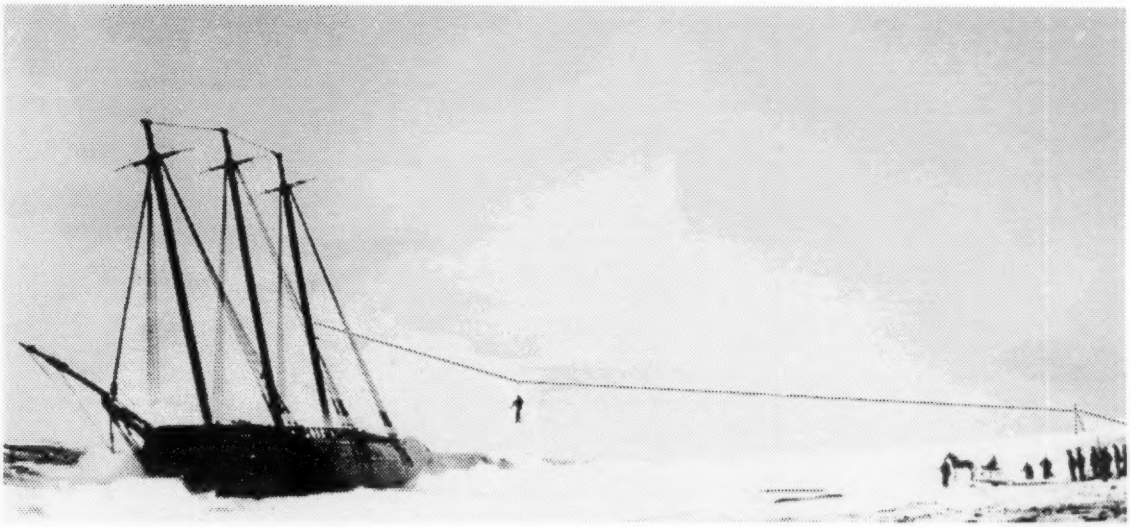
An early version of this piece appeared in ***The Compass.***

In the swirling, dark waters off Squan Beach, New Jersey, the Scottish brig ***Ayershire*** lay on her side heaving against a choking sandbar. It was mid-January 1850 and snowy spume so obscured vision, the 201 passengers could barely see the nearby shore. Some hung from the ship's icy rigging; others, too numb to grasp the ropes, lashed themselves to the vessel's splintered timbers. Their screams seemed to die in the roar of wind and surf, but they had not gone unheard.

The glow of a lantern swinging slowly back and forth appeared on shore, and men assembled, pulling a heavy cart. The tormented voices on the ***Ayershire*** screamed their gratitude and awaited the sound of the gun. Its boom resonated over the churning water and a line fell across the wreck. With a surge of renewed strength, the passengers prepared the lifeline, for the men were coming—those savers of lives.

Miraculously, only one person aboard the ***Ayershire*** perished that day, but fate might have decreed differently were it not for the crew of a nearby lifesaving station. Using the Francis Lifecar, an odd combination of boat and cablecar, lifesavers rescued the passengers four or five at a time by pulling them across a lifeline. So incredible was this particular car's performance, it was thereafter retired from service and put on exhibit in its designers' Metallic Lifeboat Factory.





U.S. Coast Guard

On March 9, 1886, a lifesaver on patrol from the Peaked Hill Bars station, Provincetown, Massachusetts found the three-masted schooner ***Hannah E. Shubert****, 398 tons from Perth Amboy, New Jersey to Boston, aground on the outer bar about 500 yards offshore and about a mile east of the station. The lifesaver summoned help, but a northeast squall came up and a salvage attempt had to be abandoned. On the next flood tide the vessel swept over the shoals and stranded on the beach.*

Lifesaving has been regarded as the supreme, human deed throughout history, receiving praise in all circles including the divine preachings of the New Testament which state, "Greater love hath no man than this, that a man lay down his life for his friends." It is duty long venerated, but efforts to organize it into a service began only a few centuries ago.

In America, an organized lifesaving effort first evolved in 1785 with the establishment of the Massachusetts Humane Society. Patterned after a similar British group, it provided small, refuge huts along Massachusetts' most dangerous beaches. These gave assistance to castaways and were stocked with clothing, food, firewood and flint and posted directions to the nearest habitation.

"It is an erroneous notion that the experience of a sailor qualifies him for a surfboatman. A sailor's home is the sea. He gives the land a wide berth and is never at ease except with a good offing."

Surfboats, designed for rescues in heavy seas, appeared a short time later and were placed in refuge houses, but the unmanned huts and their contents had become the targets of thieves. Most had to be locked and their keys left with nearby, trustworthy residents. Henry David Thoreau, on his 1849 trek through Cape Cod, took refuge from a storm in one of these huts and noted the message over its door. "For Cases of Distress Only," it read. Directions to the lifeboat key followed.

Manned lifeboat stations came into service in 1807, the first being located at Cohasset, and by 1846, eighteen stations were in service on the Massachusetts coast. A keeper was salaried to supervise each station and his volunteer crew of surfmen were paid by the number of drills and rescues they accomplished. These men were usually local fishermen who were thoroughly familiar with their section of beach and, as writer Henry Beston put it, "...had heard the roar of surf sounding about their cradles."

Surprisingly, sailors were not the ideal candidates for the job of the lifesaver. J.H. Merryman, who chronicled the Lifesaving Service in an 1880 article for Scribner's Monthly wrote, "It is an erroneous notion that the experience of a sailor qualifies him for a surfboatman. A sailor's home is the sea. He gives the land a wide berth and is never at ease except with a good offing."

The government became involved in 1837 when an act of Congress directed the Revenue Cutter Service to make "seasonal cruises along the coast for the relief of distressed mariners ...," but there was no provision in the Act for shore-based assistance . The following year, in a report on lighthouses, the Senate Committee on Commerce suggested that lifeboats be stationed at various lights to aid distressed mariners.

In 1847 Congress appropriated $5,000 to aid the lifesaving effort in Massachusetts. This money equipped a number of stations and the following year more allotments added lifeboat stations in other areas of the United States. New York followed Massachusetts' example in 1849 with the establishment of the Life Saving Benevolent Association of New York. By 1854, some 137 lifeboat stations were on duty—eventually meeting the needs of America's East and West coasts and the Great Lakes.

However, a complete lack of organization resulted in the neglect, disuse and abuse of the lifeboats and the complete isolation of some stations made them easy prey for vandals and thieves. These deplorable conditions brought a storm of public protest when, in 1854, the ***Powhatan*** went down and 300 people died.

Finally, severe storms in 1870–71 focused attention on the potential benevolence of the lifesaving endeavor ...

This wave of indignation prompted Congress to appropriate new monies for the appointment of a superintendent on the Long Island and New Jersey coasts and keepers for each station. No provision was made, however, for the employment of paid crews, so in the event of a wreck a crew still had to be gathered. Often the keeper had been appointed as a political reward and the experienced surfmen refused to work for them. Congress took little or no interest in the lifesaving services except to periodically allocate funds for their continuation. No regulations for the administration of the service were issued and keepers were not even required to maintain records of shipwrecks or aid given. The mismanagement and disorganization continued for 17 years.

Finally, severe storms in 1870–71 focused attention on the potential benevolence of the lifesaving endeavor, particularly in New Jersey, where one-third of the nation's fatalities occurred, and on the Great Lakes, where 214 people perished. The government reorganized the system by establishing a Revenue Marine Bureau headed by the Chief Clerk of the Treasury Department, Sumner I. Kimball.

Thanks to Kimball, full-time, professional keepers and surfmen were hired, stations were overhauled, new equipment was added, and beach patrols were instituted. Twelve districts, each with its own Superintendent, oversaw the stations and, as a result, 1872 saw not a single life lost where lifesaving facilities were available.

This success spurred the government into establishing the U.S. Lifesaving Service as a separate bureau in the Treasury Department in 1878. Uniforms were issued to surfmen, blue for winter and white for summer. Manuals of instruction were printed and incentive measures instituted through the issuing of awards and medals. Among Kimball's expert additions was a board to study improved lifesaving devices. Previous to this, lifesavers had relied on only a few pieces of rescuing equipment: namely the lifeboat, surfboat, lifeline and lifecar, but had achieved remarkable results. Kimball's progressive administration, in addition to introducing more modern equipment, instituted daily drills and beach patrols. Surfmen began walking the beaches between stations at night or in fog or storm to watch for ships in distress. A crew divided the patrols equally, walking an average 7 miles with each watch. They carried lanterns and red flares, called Coston Lights, to signal a wreck's position.

Patrolmen from neighboring stations exchanged tokens with each other as proof of their completed walks. A few West Coast stations had punch clocks and surfmen carried keys to punch in at their halfway point. The walk in the soft sand wearing heavy clothing was a strenuous one and the natural sandblast dulled lantern glass and stung the men's faces making direction-finding difficult.

In storms, it was often a chore to even complete a patrol and many a bewildered surfman was found wandering among the dunes at dawn. One stalwart patrolman recalled being chased on his night beat by a large, groaning object which he later discovered was a wooden cask with a hole in it. Still another devoted surfman found himself face down in the sand one night after stepping up on what he thought was a large log. It turned out to be an ill-tempered bull seal.

Beachpounders, as these patrolmen were called, walked their beats twice a night in summer and three times a night in winter when daylight hours were shorter. Writer Henry Beston recalls awakening at dawn on Cape Cod to "find the beach traced and retraced with footprints that vanished in the distance, each step a chain forged anew... in the courageous service of mankind." Patrols were assisted by lookouts on the station roof and in huts interspersed along the shore. These comfortable huts contained a stove and chair, binoculars, charts of ships' designs and flags, and signal flares. Should either patrols or lookouts sight a vessel in distress, a red-flare cartridge was ignited to warn both the vessel and the station crew. The head keeper then decided what mode of rescue would be launched and deployed his well-drilled crew.

In the case of a boat rescue, surfmen or a horse pulled the surfboat from its house on a four-wheel boat carriage and rolled it to the scene of

the wreck for direct launching into the surf. Lifeboats, on the other hand, could be rolled down a ramp into the water. Surfmen launched these boats in the "slatch" or backwash toward sea following a series of three big waves.

The lifesaving motto was: "You have to go out, but you don't have to come back," and on occasion, some did not.

The row out to a vessel was difficult, especially in storms, and once aside a wreck, care was taken to avoid collision with the ship and falling spars or rigging. Surfmen were often called upon to make a dozen trips to a stranded vessel, attesting to their incredible strength and endurance. When the surf was too intense to launch a lifeboat or surfboat, a lifeline provided the best means of rescue. In 1839, a New Jersey physician, William Newell, came up with the idea of a rescue line hurled from a cannon to a foundering ship as he watched the desperate crew of the brig ***Count Perasto*** attempting to swim to shore. This was adopted by lifesavers, as a welcome alternative to boat rescue.

Newell's lifeline was fired from a mortar-gun, later called a Lyle gun, in hopes it would snarl in the wreck's rigging or drop across her hull. A wooden rack of pegs, called the faking box, allowed the line to pay out quickly and freely and all surfmen had to learn how to wrap its intricate design. Once passengers retrieved the line, a tallyboard of instructions on preparing the hawser was drawn out. Survivors then came ashore in either the lifecar or the breeches buoy.

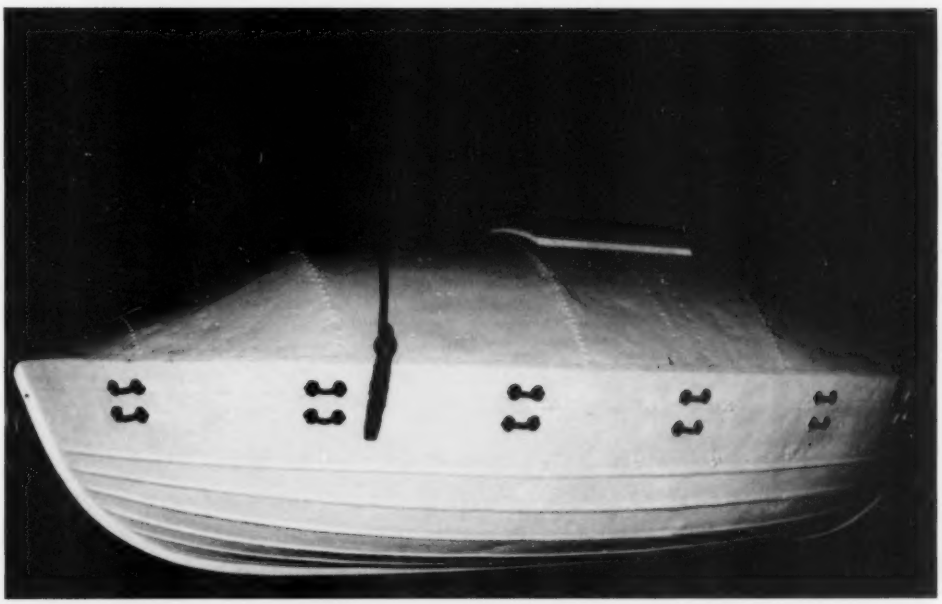
Joseph Francis' lifecar was a unique contrivance to safely convey passengers through the tumultuous surf. It was especially useful in bringing ashore women, children and injured victims, but was heavier and more cumbersome to handle than the breeches buoy. Made of thin, iron plates, it resembled a small submarine and was suspended from the lifeline by chains.

Its dark, watertight interior accommodated four or five adults and contained about 15 minutes of air, though the trip to shore usually required only 2 to 3 minutes.

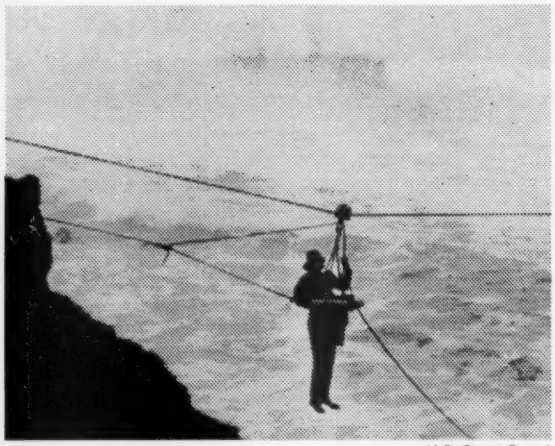
Unlike the lifecar ride, a turn in the breeches buoy was usually wet and perilous. The buoy consisted of a pair of canvas pants attached to a cork ring and suspended to the lifeline by a pulley. Only one person, or an adult holding a child, could come ashore at a time, but this method often proved safer than rescue by boat and was much lighter for the surfmen to haul than the lifecar.

Winter cold often rendered the hands of survivors too numb to rig the lines of the lifecar or breeches buoy, and surfmen had no choice but to launch a boat. No matter what the circumstances, every effort was made to effect a rescue and no surfman rested until he had done all he could. The lifesaving motto was: "You have to go out, but you don't have to come back," and on occasion, some did not.

During the first four years of operation at Point Reyes Lifesaving Station, the most dangerous on the California Coast, four surfmen died in the heavy



Once a lifeline was secured to a wrecked vessel, a lifecar could be pulled back and forth between the wreck and the safety of the shore. Looking like a primitive submarine, the lifecar could be hauled over, through or even beneath the seas. Their main problem was that they were difficult to handle and heavy. The lifecar (left) can be seen at the U.S Coast Guard Museum at New London, Connecticut. Photograph by Elinor DeWire.



U.S. Coast Guard

The breeches buoy resembled a lifesaving ring with canvas pants attached. It could be pulled out to the ship by pulleys, enabling the endangered sailor to step into the life ring and pants and then be pulled to safety much more easily than the heavier life car.

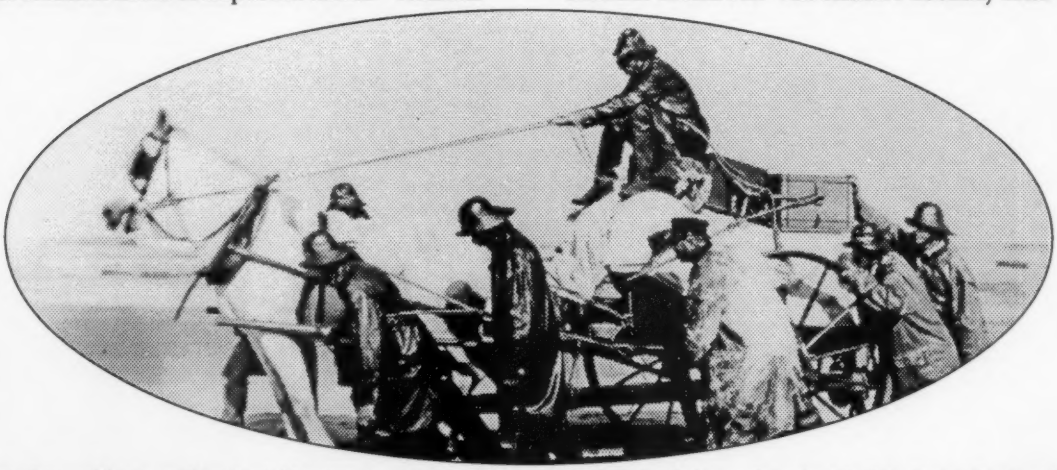
sea. Even as late as 1960, two Coast Guardsmen were lost off northern California when a freak wave capsized their 36-foot motorized lifeboat. Performing as expected, the boat righted itself and sped away, leaving the men to drown.

The surfman's duties did not cease once survivors were safely ashore. These men had to be trained to handle all manner of injuries including broken bones, frostbite and aspiration of water. Hypothermia was a frequent problem and treatment involved brandy, bathing, a mustard plaster applied to the chest, and towel wraps. Instruction manuals graphically described and illustrated the procedure for one of the most common needs of shipwreck victims– resuscitation.

Drilling was an important part of a lifesaving station's schedule, for like a well-rehearsed stage play, it ensured a smooth performance when the real occasion arose. Surfmen practiced launching the lifeboat, surfboat and beach-cart, as well as deploying the lifeline and its assisting lifecar and breeches buoy. They deliberately capsized the lifeboat during drills, then practiced righting it. In its heyday, the Lifesaving Service boasted an astounding 6 minutes for a crew to launch a lifeboat or lifeline. Drilling was largely responsible for the quick reaction.

Drilling was an important part of a lifesaving station's schedule, for like a well-rehearsed stage play, it ensured a smooth performance when the real occasion arose.

The rigorous schedule of a lifesaving crew demanded men of incomparable endurance and spirit. They received a salary of an average $700 per year in 1900, in addition to meals and board, though many surfmen chose to live with their families in shanties around the station. To meet the needs of the strenuous occupation, the crew ate five hearty meals a day and were reportedly some of the best cooks among those of the uniformed services. One Massachusetts resident remembers a delicious apple pie his mother made from a recipe given her by the brawny, six-foot cook at Calhoun's Hollow Lifesaving Station at Wellfleet. Another surfman at Marshfield, Massachusetts won first prize at a country fair for his entry - Coconut Cream Pie. The station's noonday meal was



Before they used horses, surfmen hauled beach carts containing life saving equipment by hand. It was tough going in wet sand On the Outer Banks of North Carolina, where this photograph was taken, the Midgett family became legends of the Life-Saving Service, which merged with the U.S. Revenue Cutter Service in 1915 to form the U.S. Coast Guard.

PEA ISLAND STATION

People on North Carolina's Outer Banks point out with a special pride the heroic deeds of black men and their role in the nation's maritime heritage. Pea Island was especially honored by African–American communities in the Cape Hatteras, Nags Head, and Manteo, North Carolina area between 1880 and 1949.

"The heroic deeds of U.S. Lifesaving Service surfmen are well known, especially to Coast Guardsmen and to long-time coastal residents along the Atlantic Seaboard," said Rhett B. White, director of the North Carolina Marine Resources Center and Aquarium on Roanoke Island. "But unbeknownst to most Americans, including Coast Guardsmen, some of those early lifesavers were black."

Richard Etheridge became the first black man appointed as keeper of a lifesaving station in the U.S. Lifesaving Service on January 24, 1880. When the *M&S. Henderson* foundered on Nov. 30, 1789, no one answered its calls for help and four crewmen drowned. An investigation established that the all–white Pea Island lifesaving crew had neglected its duties. Charles F. Shoemaker, assistant inspector of the Lifesaving Service, picked Etheridge to replace the keeper at Pea Island, because of his reputation as "one of the best surfmen on this part of the coast of North Carolina." Etheridge's all–black crew were all experienced fishermen and oystermen. Etheridge quickly gained a reputation for running one of the tautest lifesaving stations on the Carolina coast.

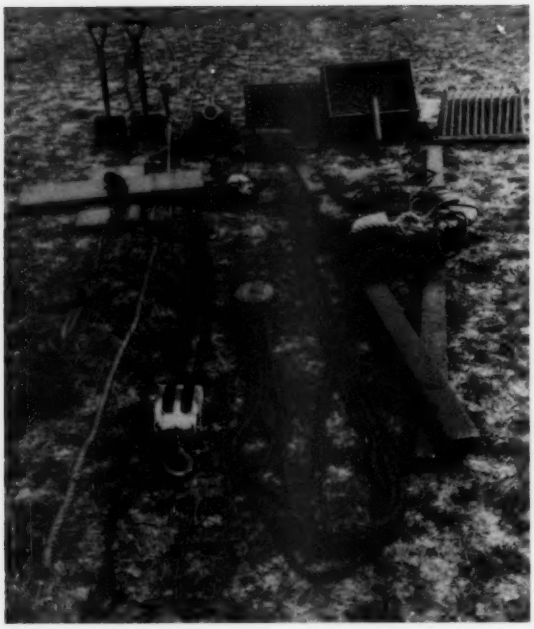
Their most famous rescue—according to White—involved the crew and passengers of the *E.S. Newman* on Oct. 11, 1896. A storm blew the *Newman* into the area known as the "Graveyard of the Atlantic" and the three-masted schooner carrying nine people—the captain's family and a crew of six—slammed onto the beach near Cape Fear, about 2 miles south of Pea Island. Having seen the distress flares from the ship, Etheridge and his six–man crew loaded a beach cart, hitched up a team of mules and headed south. The men and mules struggled through sweeping currents, knee–deep wet sand and sea foam. Their cart was laden with heavy coils of safety line, powder shot, a 150–pound Lyle gun for firing a safety line to the ship, and other rescue equipment. The storm was so fierce that waves coming from Atlantic washed over the entire island to the sound. "It seemed impossible under such circumstances to render any assistance. The storm tide was sweeping across the beach, and the (mule) team was often brought to a standstill by the sweeping current,." Etheridge later wrote in his log.

When they reached a point opposite the wreck, there wasn't any solid ground on which to place the heavy Lyle gun, nor could they launch the lifeboat or use a breeches buoy. Etheridge told Meekins and another of his strongest surfmen to tie large-sized shot lines around themselves and to wade into the surf as near the side of the vessel as possible. Fighting wind and wave, the two men struggled to save their own lives so they could rescue those clinging to the wreck. Reaching the side of the vessel, they managed to throw the heavy lifeline aboard. The ship's crew in turn hauled the surfmen on board the grounded ship. There they tied the skipper's 3–year old child to the back of one of the surfmen. He then climbed back into the vicious sea and fought his way to shore. Each time two surfmen returned to shore with a passenger, another pair headed for the wreck. This was repeated until everyone on board the *Newman* was rescued.

White believes the press never headlined the heroics of the surfmen, solely because they were black. Etheridge remained as keeper of the Pea Island Lifesaving Station until his death on May 8, 1900. The Coast Guard dedicated a monument to the black lifesavers in February 1991 during Black History Month. It's located a few feet from Etheridge's burial site. Through White's efforts, a Richard Etheridge exhibit is on permanent display at the aquarium. The 10-painting exhibit was created by black artist James Melvin of Nags Head. Melvin's artwork (example above) depicts the rich heritage of America's first black coastal heroes. "There are few well-known role models in our maritime heritage for black youngsters or for young people from other minorities," said White.

The lifesaving station was auctioned off and removed years ago,while the inlet closed up, and Pea Island became part of Hatteras Island. However, the pride lives on, passed from generation to generation. "Tens of thousands of schoolchildren visit the Outer Banks every year. About a third of them are black," White noted. "They see the 16th century ship *Elizabeth II*, which is white English America; the Lost Colony, which is Indian and English history; the Wright Brothers memorial first flight another white experience. Now, when they come by the aquarium and see the exhibit of the black lifesavers; that's something the black youngsters can relate to something they can be proud of. It has a special importance to them."

Rudi Williams
American Forces Information Service



U.S. Coast Guard

The lifesaving equipment pictured above was developed during a century of use, beginning in the late 1840s. The Lyle gun used to throw the shot to the distressed vessel is to the left of the shovels. To the right of the Lyle gun is the faking box with a readied line in it. When needed for a rescue, the ready faked line was lifted from the peg board (note peg board to the left of the faking box without the line and one to the right with the line), laid in the box and the end tied to the eye of the projectile fired by the Lyle gun. Faking allowed the line to pay out smoothly with minimum friction and no snarling.

always the largest and consisted of huge portions of meat, vegetables, soup, bread and pie or pudding. Porridge was kept on the boil continually, since it was a staple at breakfast and supper and a necessity for the revival of cold surfmen or rescued survivors. The coffee pot was never allowed to go dry and liquor was dispensed mainly for medicinal purposes.

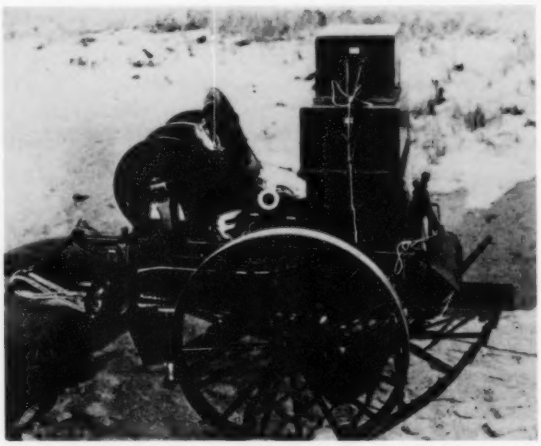
A typical lifesaving station consisted of a main house, in which the head keeper and his family might live along with single members of the crew. Married surfmen had to provide quarters for their families, but on occasion, the government built a separate house for the headkeeper. Crews on call slept on the second floor of the station house, and a watch was posted in the tower atop the roof. Sometimes a separate tower stood on a high point of land overlooking the beach. It contained no chairs, for it was believed a man standing was more alert than one sitting. A kitchen and mess occupied the first floor of the station, as well as a living room and an apparatus room for storage of lifesaving equipment. The boathouse was either attached to the main house or in a separate building nearby. Its large, barn-like doors swung wide and, if it housed a lifeboat, a ramp ran from it out to the beach.

In the late 1800s, advances in lifesaving equipment gave surfmen a survival advantage. Self-righting lifeboats appeared with heavy, iron keels and upper air chambers that forced the boat to right itself when capsized. Self-bailing boats had a deck a few inches below the load line with pressure-sensitive tubes running down to the bottom of the vessel to empty it. In addition, lifebelts made of cork were required dress for drill and rescue. They allowed the surfman free use of his limbs while supporting the weight of two persons in the event of a swimming rescue.

With the advent of metal hull construction and steam power, ships became larger, more durable and infinitely maneuverable.

Prior to 1899, all lifeboats were propelled by oars except for a few rare sailboats, but in that year an officer with the Revenue Cutter Service designed a motorized boat that gained wide acceptance after the turn of the century. The old image of the expert oarsman began to fade. By 1915, 220 rescue boats, all self-righting and self-bailing, were operating at lifesaving stations. The taxing chore of rowing to a wreck had disappeared and a new era in rescue began.

The lifesaving Service and Revenue Cutter Service found themselves working side-by-side more

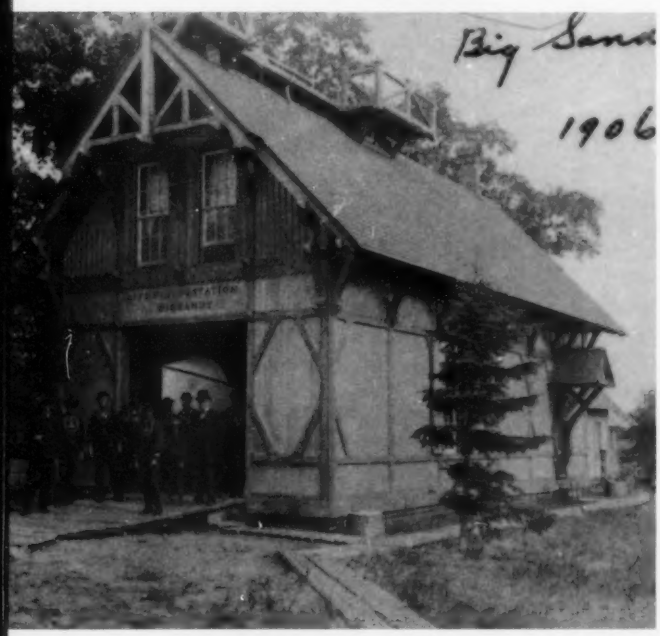


U.S. Coast Guard

A compact beach-cart (above) was ideal for beach use and could be pulled by a man. Michigan City, Indiana shown in 1906 (above, right) typified lifesaving stations of the era and the drills were often a spectator sport.

Elinor DeWire

The Old Harbor Lifesaving Station (above) is located on Cape Cod, Massachusetts at Race Point. The shot of Big Sandy (below) was taken in 1906 on Lake Ontario. Early stations consisted of one utilitarian building measuring 42 by 18 feet, but by the 1880s they were becoming more fashionable and some were built to resemble a Swiss chalet and one was even designed with a clock tower.



U.S. Coast Guard

often as the maritime industry moved into the twentieth century. With the advent of metal hull construction and steam power, ships became larger, more durable and maneuverable. The nature of marine casualties was such that a joint effort between the two services was almost always needed so the government merged the Lifesaving Service and Revenue Cutter Service 1915 to form the U.S. Coast Guard.

"When I see a man clinging to a wreck, I see nothing else in the world, and I never think of family and friends until I have saved him."

The days of the muscular surfmen wielding their oars toward a cumbersome wreck are over, but the Coast Guard has not forgotten the lifesaver's motto, but rather replaced it with its own "Semper Paratus". Coast Guardsmen still must go out, but modern rescuing methods and equipment ensure that they come back. For them, lifesaving remains as glorious and humane a service as it was for their predecessors, only less perilous.

In the words of one gallant 1880s surfman, there is no compromise when it comes to saving a life: "When I see a man clinging to a wreck, I see nothing else in the world, and I never think of family and friends until I have saved him."

The USCGC *Tamaroa*— Modern Day Lifesavers

Rick Booth

Hurricanes get names and hype, but for old-fashioned natural violence it's hard to beat a classic Northeaster like the one that raked New England on Halloween week (1991), mauling Coast Guard assets and writing new chapters in the history of search and rescue.

Tracking west southwestward, the storm generated winds in excess of 80 knots, roiling seas to well over 40 feet. Pounding surf and high tides left havoc behind, notably among southern New England lighthouses and other aids-to-navigation. "Damage" read a Coast Guard message to Atlantic Area headquarters on Governors Island, "far exceeded that of Hurricane Bob in August."

First District search-and-rescue files bulged, from relatively small coastal cases, run by 44-foot motor lifeboats, to the one that captured national attention.

Rick Booth is the editor of the *First Word* a publication out of the U.S. Coast Guard's First District, where this story first appeared.

So intense was the district response that Secretary of Transportation Samuel B. Skinner made a special trip to congratulate First District crews. Skinner stopped first at Air Station Cape Cod, where flight crews were recovering from more than 72 hours of the most intense activity in memory, and then at the Cutter ***Tamaroa*** (WMEC-166), whose work in the storm captivated the region.

... an underlying note of sadness played, as Coastguardsmen remembered a fellow lifesaver still missing.

Throughout a day celebrating lifesaving, an underlying note of sadness played, as Coast Guardsmen remembered a fellow lifesaver still missing. An Air National Guard helicopter crewman, deployed from Suffolk County, Long Island to assist the Coast Guard search-and-rescue effort, became separated from four others in his Flight when their helicopter was forced to ditch in heavy seas. ***Tamaroa*** rescued the four, and searched vainly for the fifth. The cutter ***Spencer*** (WMEC-905) spent nearly a week searching as well, having responded to a midnight call to steam from Boston at the peak of the storm.

When the storm began, ***Tamaroa*** was in the protection of Provincetown, anchored in the lee of the tip of Cape Cod. Word arrived that the sailing vessel ***Satori*** and its three people on board needed help about 75 miles south of Nantucket Island. ***Tamaroa*** weighed anchor and set the special sea detail. The ship slipped into the Cape Cod Canal about 2 a.m. (LST) on Tuesday, October 29. The canal cuts through the shoulder of the Cape, shunting many miles from the route ships would otherwise take between Vineyard Sound and Massachusetts Bay.

The canal cut steaming time, but not without cost. "We were forced to set the special sea detail going through," said CDR Lawrence G. Brudnicki, Tamaroa's commanding officer, "so those guys didn't get as much sleep as they otherwise might for when they needed it."

Through the canal and into

*The sailing vessel **Satori** (left) is being tossed about on the Atlantic in 35- to 40-foot seas, while being battered by 75-knot winds. Both the sailboat and the Hurricane, which was the Tamaroa's smallboat, were lost but the First District aircrew recovered both crews. Photo courtesy of the USCGC Tamaroa.*

deeper water, Brudnicki ordered as much speed as Tamaroa's diesel-electric propulsion plant could send to its single shaft. Built in 1943 as a Navy fleet tug, ***Tamaroa*** "can tow an aircraft carrier," as the hands often tell visitors, but it was never a sprinter. This time it nearly met its match in steadily building waves. "We were making turns for eight and nine knots," Brudnicki said, "and only doing about two-and-a-half over the bottom."

Slowly the ***Tamaroa*** crawled offshore to the ***Satori***, then being monitored by aircraft from Cape Cod. "Seas weren't too bad at that point," said Chief Boatswain's Mate T. David Amidon. "They were only about 15 to 20 feet."

Radio consultation among ***Tamaroa***, ***Satori***, and the District Operations Center in Boston determined that ***Tamaroa*** would launch a small boat, to transfer cold weather survival clothing to ***Satori***. As Tamaroa's most experienced coxswain, Amidon would make the trip in the ship's 21-foot rigid-hull inflatable Hurricane. ***Tamaroa*** has launched its smallboats literally thousands of times, but as Amidon and every one of his shipmates knew, all bets are off when the weather wills it. Amidon picked for the ride two seasoned hands, MK1 Herb Summers and BM3 Jeffrey R. "Reggie" Ruggeiro.

The trip did not begin auspiciously. Small boat launching at sea is fraught with hazard enough. In the storm things were far trickier. "We tore a lifting eye practically out of the fiberglass before we even left the ship," Amidon said.

"Then the weather really picked up," Amidon said, "increasing to 25- to 35-foot breaking seas."

On its own, the little Hurricane scurried between the creamy peaks of the gray waves, delivering survival suits to ***Satori***. But in so doing, a wave, "just lifted us up, and brought our bow of the boat down on the sailboat," Amidon said. "The impact ruptured one of our pontoons." From that point, Amidon needed all his skill and experience just to keep the Hurricane oriented to wind and weather in a way that kept it from being swamped. Picking up the ***Satori*** crew was now out of the question. Even getting back aboard ***Tamaroa*** was a question, one Amidon weighed in his mind for two long hours as his crippled boat played shepherd to the pitching sloop. "Then the weather really started to pick up," Amidon said, increasing to 25-to 35-foot breaking seas. It became obvious that the ***Satori*** people would have to come off—and that the Coast Guard smallboat couldn't do it, not in those seas with a half-deflated hull. The Hurricane crew watched as a man and two women slipped from the sloop into the water, fortunately about 70°F thanks to a helpful Gulf Stream. From there a Coast Guard rescue swimmer, deployed from a Cape Cod HH-3F, guided

them in turn into the helicopter's hoisting basket. Eying their flawless ascent, Tom Amidon was still assessing the chance of getting himself and two others safely back on ***Tamaroa***. With seas building by the minute, and the Hurricane sluggish as periodic waves defied the coxswain's touch and filled the boat, the chances of at least a few broken bones were excellent.

"What do you want to do, Boats?" asked an unseen ***Tamaroa*** voice from the Hurricane's portable radio speaker. The chief looked at his two charges.

"I want to go into the water," he said matter-of-factly, "and have the helo pick us up."

On the ship, Brudnicki conferred with his senior people: Executive Officer LCDR Melville B. Guttormsen, Operations Officer LT Kristopher G. Furtney, and QMC Steven J. Harblin. All knew the odds. Furtney delivered the verdict to the Hurricane: "Go ahead, Chief."

"It turned out to be the easiest part of all," Amidon said, "We just slipped into the water, and the wind took the boat right away from us. The helo lowered the basket, and we got in. About an hour and a half later, we were on Cape Cod."

"... 15 seconds later there wasn't a Mustang suit hanging up anywhere. They were all on somebody."

With the weather now truly foul, even by Coast Guard standards, another emergency flared. High in the sky and miles away, the Air National Guard HH-60 Pavehawk crew came to the realization that mid-air refueling from an Air Guard KC-130 tanker would be impossible, and the helicopter was out beyond range of shore. "We're going to land in the water in about

30 minutes," its pilot told First District Operations. "Where do you want us to head?"

District controllers scanned the charts, calculating quickly. ***Tamaroa*** was closest. Soon aircraft and cutter were communicating directly by VHF radio. "The last thing we heard from him was that he had 40 pounds of fuel left," said Brudnicki, or about enough for the landing and that was it.

Many said later, that the Captain's announcement that the ship was "diverted for SAR" electrified the crew. "We heard it was an Air National Guard helo," said MKC Christian R. LaPense, "and about 15 seconds later there wasn't a Mustang suit hanging up anywhere. They were all on somebody." The National Guard air crew, everyone on ***Tamaroa*** knew, was an air rescue asset itself—the ship was rescuing one of its own. At least they had a pretty good position fix. ***Tamaroa*** again put everything it had to the main shaft. The Pavehawk had gone in less than 15 miles away, but conditions like these translated 15 miles into almost 5 hours. For all that time ***Tamaroa*** surged through swells at least as high as anything anyone onboard had ever seen- including XO Guttormsen, the Coast Guard's officer *Ancient Mariner*.

"If I ever fly in an airplane at night," observed Brudnicki, "I'm going to wear five or six strobe lights because we wouldn't have found them if they hadn't been wearing strobes."

"... But once we saw those strobe lights, it didn't seem like we worried about the waves."

Lookouts spied the bobbing pinpricks of light, raising the ship wide alarm. Furtney had the con. "She likes to ride beam-to," Furtney said of ***Tamaroa***, "so I tried to put us beam-to and up-swell, to drift down to where they were." Meanwhile, ENS William F. Moeller, the first lieutenant, supervised the deck force as they hung scrambling nets on both sides of Tamaroa's bow. Moeller and BM1 Mark P. Gibbons both feared losing a man over the side. "We used the partner system,"

A freighter (left) attempts unsuccessfully to assist the Satori. Photo courtesy of the USCGC Tamaroa.

As a result of the First District's response, Secretary Samuel B. Skinner rearranged his schedule to visit both the Tamaroa and Air Station Cape Cod. Displaying "Way to Go" pins presented to them are Tamaroa hands (left to right) HS2 Tim Merrell, SN Eric Pope, DC1 Alberto Alicea and SN Mark Madden. Photo by Rick Booth.

Moeller said. "We paired off. Every time a big wave broke, you called out your partner's name to make sure we hadn't lost anybody." Wave after wave smashed green across the forecastle, but every partner answered, every time.

Once the man was aboard, so tenacious was his grip on the net that his fingers had to be pried free.

"In one way, the darkness helped us on deck," Moeller said. "We couldn't see how big the waves were. Guys were hiding behind bitts and things like that, crawling out when they had to. But once we saw those strobe lights, it didn't seem like we worried about the waves."

The first airman aboard was apparently the least worn from his ordeal, rescuers said. When first sighted, all four were together in the water, arms linked. As ***Tamaroa*** drifted down on them, one man broke from the others and swam for the scrambling net. Just as he reached the ship's side, ***Tamaroa*** lifted on an especially large crest, "and he drifted under the stern," Moeller said. "We had to scramble from the port side to the starboard." Nevertheless, a dozen ***Tamaroa*** hands heaved the instant his hand found the mesh. "We were really pumping some adrenaline," Moeller said, "so that net came aboard fairly fast." Once the man was aboard, so tenacious was his grip on the net that his fingers had to be pried free.

While all hands maintained the usual "man overboard" watch on those bobbing strobes, Furtney maneuvered the ship to get the remaining three men. After frustrating moments, all three remaining airmen had their hands on the starboard netting–when the bow disappeared under a sea. As the Atlantic cascaded away, "two of them were gone," Moeller said "They'd been swept down the starboard side and under the stern."

On the fantail, SN Pope and SN Martin T. Haddock Jr. looked over, horrified to see one of the men hanging onto Tamaroa's huge rudder. "Get out of there," they yelled, but the man obviously could not help himself. It was a tense moment. Fortunately, the same seas that put him there removed the man seconds later. "They both just drifted around to the port side, and we got them over the rail," Moeller said.

The rescue left a deep impression on the men of the ***Tamaroa***, and Eric Pope seemed to sum it up for them all. Standing there on Tamaroa's oh-one deck, he examined a label pin presented to him by his agency's highest official, Sam Skinner. Inscribed with the Department of Transportation logo, it reads "Way to Go."

"You know," Pope said softly, "we do a lot of jobs out here. We do everything they ask us to. But this is search and rescue–and that's what it's all about."

Western North Pacific Typhoons—1991

Staff, Joint Typhoon Warning Center

NASA

This spectacular telephoto image from the NASA Space Shuttle Atlantis' mission STS-44 captures Super Typhoon Yuri at 0404 UTC on November 28. Note the cyclonically curved stratocumulus clouds in the high horizontal speed shear zone near the edge of the eye wall.

This summary is based upon the *1991 Annual Tropical Cyclone Report* prepared by the Joint Typhoon Warning Center, Guam, Mariana Islands. Our thanks to Captain Dieter K. Rudolph of the U.S. Navy, Lt. Col. Charles P. Guard of the U.S. Air Force and their staff.

In the western North Pacific, 1991 was another record-breaking year for the number of warnings issued– 835 (41 more than last year) on 32 tropical cyclones. The total number of tropical cyclones was one more than the climatological mean of 31 and a carbon copy of 1990 (If Enrique, which tracked westward from the Eastern Pacific, is considered).

The 1991 season included five super typhoons, fifteen lesser typhoons, ten tropical storms, and two tropical depressions. Like the preceding 2 years, the number of typhoons and super typhoons was above average, but there were fewer than normal tropical depressions.

JANUARY THROUGH JUNE

Sharon (01W), the North Pacific's first tropical cyclone of the year, developed early in March in conjunction with a burst of equatorial westerly winds that extended eastward from New Guinea to the International Dateline. Sharon tracked over the central Philippine Islands and continued westward across the South China Sea to dissipate in southeastern Vietnam on March 16. Close behind Sharon, Tim (02W) developed in the eastern Caroline Islands during March. Tim's recurving track proved difficult to predict for JTWC, and average forecast errors for Tim were the largest of any Northwest Pacific tropical cyclone in 1991. On the 24th of April, Vanessa moved across the central Philippines as a weak tropical depression, then peaked with winds at 45 knots (23 m/sec) in the South China Sea. Its remnants moved northward through the axis of the subtropical ridge and dissipated southwest of Hong Kong. A week later, Walt (04W) came to life south of 5° North, in the eastern Caroline Islands. Walt became the year's first super typhoon and the only significant tropical cyclone to form in May. It developed as part of an equatorial convective process known as a *westerly burst* at the same time a twin, Tropical Cyclone Lisa (21P), formed in the Southern Hemisphere.

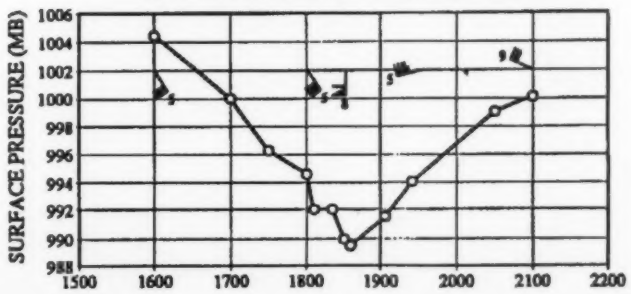
Typhoon Yunya (05W) was

WESTERN NORTH PACIFIC SIGNIFICANT TROPICAL CYCLONES FOR 1991

TROPICAL CYCLONE	PERIOD OF WARNING	NUMBER OF WARNINGS ISSUED	MAXIMUM SURFACE WINDS KT (M/SEC)	ESTIMATED MSLP (MB)
(01W) TS SHARON	05 MAR - 14 MAR	33	60 (31)	980
(02W) TY TIM	21 MAR - 25 MAR	20	70 (36)	972
(03W) TS VANESSA	23 APR - 28 APR	20	45 (23)	991
(04W) STY WALT	06 MAY - 16 MAY	40	140 (72)	898
(05W) TY YUNYA	13 JUN - 17 JUN	16	105 (54)	938
(06W) TY ZEKE	09 JUL - 14 JUL	21	80 (41)	963
(07W) TY AMY	15 JUL - 20 JUL	18	125 (64)	916
(08W) TY BRENDAN	21 JUL - 24 JUL	16	70 (36)	972
(09W) TY CAITLIN	23 JUL - 30 JUL	27	95 (49)	949
(06E) TS ENRIQUE	01 AUG - 01 AUG	3	35 (18)	997
(10W) TS DOUG	08 AUG - 11 AUG	9	35 (18)	997
(11W) TY ELLIE	10 AUG - 19 AUG	34	85 (44)	958
(12W) TY FRED	11 AUG - 18 AUG	27	95 (49)	949
(13W) TD 13W	12 AUG - 13 AUG	5	25 (13)	1004
(14W) TY GLADYS	16 AUG - 23 AUG	31	65 (33)	973
(15W) TD 15W	26 AUG - 29 AUG	11	30 (15)	997
(16W) TS HARRY	29 AUG - 31 AUG	10	40 (21)	994
(17W) TY IVY	02 SEP - 10 SEP	32	115 (59)	927
(18W) TS JOEL	03 SEP - 07 SEP	15	55 (28)	982
(19W) TY KINNA	10 SEP - 14 SEP	17	90 (46)	954
(20W) TS LUKE	14 SEP - 19 SEP	20	50 (26)	987
(21W) STY MIREILLE	16 SEP - 27 SEP	48	130 (67)	910
(22W) TY NAT	16 SEP - 02 OCT	61	110 (57)	933
(23W) TY ORCHID	04 OCT - 13 OCT	37	115 (59)	927
(24W) TY PAT	05 OCT - 13 OCT	31	125 (64)	916
(25W) STY RUTH	20 OCT - 31 OCT	40	145 (75)	892
(26W) STY SETH	01 NOV - 14 NOV	56	130 (67)	910
(27W) TS THELMA	01 NOV - 08 NOV	23	45 (23)	991
(28W) TS VERNE	05 NOV - 12 NOV	28	55 (28)	984
(29W) TS WILDA	14 NOV - 20 NOV	22	45 (23)	991
(30W) STY YURI	23 NOV - 01 DEC	36	150 (77)	885

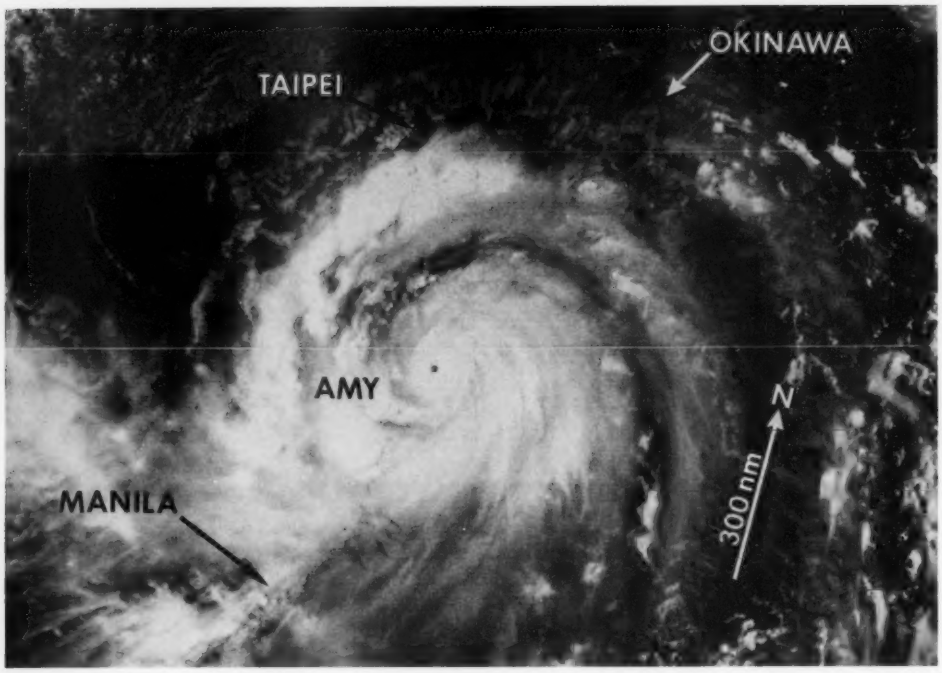
the first significant tropical cyclone of June, breaking a nearly month-long lull in activity in the western North Pacific. Yunya was noteworthy because the USNS *Spica* steamed through its center, providing a unique glimpse of the structure of a rapidly-developing, midget typhoon. Yunya made landfall in central Luzon near midday on the 15th and the associated heavy rainfall caused flooding that washed away bridges and left one person dead. However, this direct impact of Yunya was relatively minimal compared to its subsequent influence on the massive cloud of ash produced by the eruption of Mount Pinatubo on the same day. As Yunya crossed central Luzon, its deep cyclonic circulation redistributed the ash, which normally would have been carried out over the South China Sea. At Clark Air Base and Subic Bay/ Cubi Point naval complex the ash resulted in the downing of powerlines and the collapse of most flat-roofed buildings.

USNS SPICA PASSAGE THROUGH YUNYA



JULY

Zeke (06W) was the first tropical cyclone to develop during the month of July, and initiated a period of nearly continuous tropical cyclone warnings in the Northwest Pacific that lasted through early December. Typhoon Zeke made landfall three times before it dissipated over the mountains of northern Vietnam. The second of five July tropical cyclones, Amy (07W), followed a west-northwesterly track that paralleled the one taken a



Amy, with an intensity near 115 knots, and a small eye only 10 nautical miles in diameter, passes through the Luzon Strait. The satellite photograph is NOAA visual imagery and was taken on the 18th of July at about 0546 UTC. Amy's peak winds were estimated at 125 knots later in the day, but a weakening trend began late on the 18th as the typhoon approached the coast of mainalnd China.

week earlier by Typhoon Zeke. Amy caused the loss of the 16,000-ton freighter, ***Blue River***, with its entire 31-man crew, west of Taiwan, near the Pescadores Islands. Hengchun, on the southern tip of Taiwan, reported sustained winds of 66 knots (33 m/sec) with gusts to 150 knots (75 m/sec) at 2000 UTC on the 18th. Amy plowed into southeastern China, where it was responsible for 99 deaths. Torrential rains associated with Brendan's (08W) passage across northern Luzon unleashed avalanches of volcanic debris, mud, and boulders in the valleys near Mount Pinatubo. The mudflows were up to 15 feet high in the river valleys near the volcano and three fatalities were reported. Brendan also caused 100 deaths in China.

After a succession of three straight-running July typhoons (Zeke, Amy and Brendan) which moved west-northwestward, Caitlin (09W) became the first cyclone of the season to threaten Japan and Korea. Much-needed heavy rains fell on drought-stricken Okinawa as Caitlin passed west of the island.

Enrique (06E), a tropical cyclone which began in the Eastern Pacific on the 15th of July, trekked 4900 nautical miles (9100 km) across the central North Pacific Ocean, regenerated, reached minimum tropical storm intensity, and then dissipated in the JTWC area of responsibility. Over the past 20 years, Typhoon Georgette (1986) was the only other Eastern Pacific tropical cyclone to cross the International Dateline.

AUGUST

Doug (10W), the first of six August tropical cyclones, failed to intensify beyond minimal tropical storm strength because it moved rapidly northward into an area of colder sea surface temperatures and increased vertical wind shear before becoming an extratropical cyclone. Ellie became the second midget typhoon of 1991, maintaining a generally westward track as it traveled 2,400 nautical miles (4,440 km) across the western North Pacific, from just west of Wake Island to Taiwan. Next came Fred (12W), which was spawned by the Asian monsoon trough and became part one of two, three-storm outbreaks that occurred in mid-August. Typhoon Fred skirted the northern coasts of Luzon and Hainan Island before dissipating over Southeast Asia. During Fred, a 20,000-ton oil exploration barge capsized and sank 65 nautical miles east of Hong Kong on the 15th. Of the 195 crew members on board the 420-foot long ***Derrick Barge 29***, 22 perished, including 4 divers who were trapped in a saturation diving chamber beneath the barge. The rescue of the 173 survivors was accomplished by helicopter and tugboat. On Hainan, 16 people were killed.

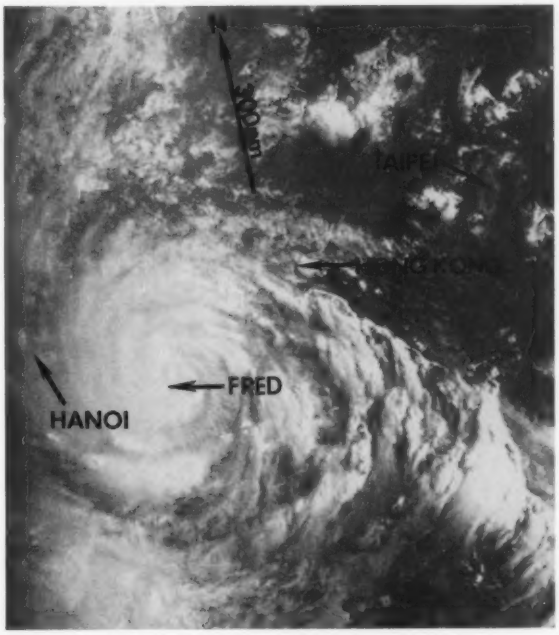
Tropical Depression 13W formed as a low pressure area tracking northwestward in Ellie's wake. Tropical Depression 13W was marked by large diurnal fluctuations in convection, which slowed the development of strong surface

winds. The largest of the six August tropical cyclones was Typhoon Gladys (14W). Gladys' wind field expanded dramatically with only a small change in minimum sea-level pressure as it tracked south of Korea and western Japan. Gladys' huge circulation caused record rainfall amounts in Korea and Japan. The South Korea Disaster Relief Center reported at least 90 people dead or missing. Pusan recorded 24 inches (610 mm) of rain in 20 hours and Gladys also dumped up to 28 inches (710 mm) of rain on central Japan, triggering landslides which killed 10 people. When animated satellite imagery indicated cyclonic turning in an area of deep convection, a Significant Tropical Weather Advisory was reissued to include the disturbance that was to become Tropical Depression 15W. Five days later Harry (16W) became the last of the six August tropical cyclones.

SEPTEMBER

Ivy (17W) was the first tropical cyclone since Fred to form in the monsoon trough, which re-established itself eastward from Asia through the Caroline Islands. Ivy was also the first significant threat of the typhoon season for the Mariana Islands. For 4 days, the tropical cyclone tracked west-northwestward, straight towards Guam, then on September 4 it took a sudden, unanticipated turn to the north northwest and headed for the Northern Marianas and subsequently Japan. Joel (18W) developed in the South China Sea, tracked westward where it then came to an abrupt halt. After 6 hours it finally inched northward and made landfall 70 nautical miles (130 km) east of Hong Kong on the 7th. A day later, Kinna (19W) formed in the western Caroline Islands. It became the most destructive tropical cyclone to strike Okinawa since 1987, and the first typhoon to pass directly across the island since Vera in 1986. Later, the typhoon also passed directly across Sasebo, Japan, and caused extensive damage on Kyushu and Honshu as it raced northeastward after recurvature. As Kinna became extratropical, Tropical Storm Luke (20W) formed just east of the Mariana Islands. It began as a broad monsoonal cyclone, difficult to track by satellite, and had the largest initial position errors of the season. Luke's unusual recurvature resulted from the extension of the mid-latitude, mid-tropospheric westerlies deep into the tropics in mid-September, which temporarily broke down the subtropical ridge in the western Pacific.

Mireille (21W) was part of a three-storm outbreak in September consisting also of Tropical Storm Luke (20W) and Typhoon Nat (22W). After Luke had turned extratropical, Mireille, Nat and Typhoon Orchid (23W) became part of another three storm outbreak. Mireille was the second super typhoon of the year in the Northwest Pacific, and became the worst storm to strike Japan in three decades. It outgrew its early midget size after passing Saipan, and reached super typhoon intensity several days before threatening Okinawa, which experienced 27 hours with winds of more than 50 knots (41 m/sec). Recurving just to the southwest of Okinawa, the typhoon accelerated, cutting a path across western Kyushu and Honshu. Over the Sea of Japan, Mireille became an intense extratropical cyclone and slammed into northern Honshu and southern Hokkaido producing gusts to 83 knots (43 m/sec) at Misawa Air Base. Press reports from Japan, indicated that 52 deaths were associated with the typhoon, including 10 crew members of a South Korean freighter that capsized while in the port of Hakata on the island of Kyushu. For 17 days, Typhoon Nat (22W) exhibited highly erratic behavior, which included four major track changes, two intensification episodes, and two landfalls. It persisted longer than any other western North Pacific tropical cyclone during 1991, requiring a



Typhoon Fred is at minimal typhoon intensity about 120 nautical miles south of Hong Kong on the 15th of August at about 0030 UTC. A narrow ridge over southern China persisted and Typhoon Fred passed to the south of Hong Kong. After passing along the northwest coast of Hainan Dao on the 16th, with estimated winds of 95 knots, the typhoon weakened and took an unanticipated southwestward track across the Gulf of Tonkin.

This visual NOAA satellite image of Typhoon Pat at 0511 UTC on the 7th of October was transformed by the Meteorological Imagery, Data Display, and Analysis System (MIDDAS) software into a three-dimensional cloud map by vertically shifting each pixel according to its infrared brightness temperature-derived height. The map was then rotated to produce this dramatic pseudo-perspective.

total of 61 warnings, only 18 warnings shy of the all-time record set by Typhoon Rita (1972).

OCTOBER

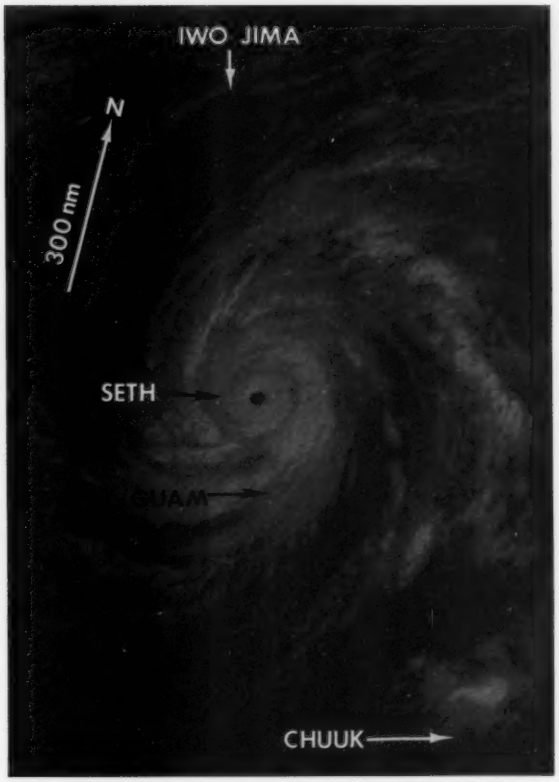
Typhoon Orchid (23W) was the first tropical cyclone to develop during the month of October and was followed within a day by Typhoon Pat (24W). As these two typhoons interacted, Orchid slowed about 200 nautical miles (370 km) off the coast of Japan, causing widespread flooding in Tokyo and surrounding cities. Developing at the same time, Typhoon Pat's (24W) track paralleled that of Orchid's, but several hundred miles to the east. Two days after Orchid and Pat turned extratropical east of Japan, Ruth (25W) developed in the eastern Caroline Islands. Super Typhoon Ruth was the second most intense tropical cyclone of 1991. Climatological analogs enabled forecasters to anticipate Ruth's rapid deepening to super typhoon intensity in the Philippine Sea. However, track forecasts based on the NOGAPS spectral model were 2 days early in predicting recurvature. This resulted in the largest forecast track errors of the year as Ruth slammed into northern Luzon instead of recurving toward the Ryukyu Islands. During Ruth 18 lives were lost when the freighter ***Tung Lung*** sank west of Taiwan. Another 18 crewmen were rescued in heavy seas after the freighter ***Southern Cross*** sank northeast of Taiwan.

NOVEMBER

As Ruth recurved, Super Typhoon Seth (26W) started cranking up in the southern Marshall Islands. It was the first of six tropical cyclones of at least typhoon intensity to occur in the month of November. This was the most active November in the western North Pacific since 1964 when six occurred. Forecasts for Seth's generally westward track were complicated by the normally reliable objective guidance that, in Seth's case, indicated recurvature which did not occur. When Seth formed, Thelma (27W) slowly intensified in the central Caroline Islands. The worst loss of life due to a natural disaster in the western North Pacific during 1991 occurred when Tropical Storm Thelma made landfall in the central Philippines.

News accounts estimated that 6000 people died and 20,000 people were made homeless by landslides, flash flooding, and the failure of a dam. The highest casualties occurred on Leyte and Negros Islands where widespread logging had stripped the hills bare of vegetation.

On November 3, westerly low-level winds along the equator and a persistent cloud system near the International Dateline generated the tropical disturbance which eventually became Tropical Storm Verne (28W). Tropical Storm Verne passed between Pagan and Agrihan in the northern Mariana Islands with a maximum intensity of 55 knots (28 m/sec), and closed to



DMSP satellite visual imagery shows Super Typhoon Seth at its peak intensity at about 2330 UTC on the 3rd of November. Seth's track was difficult to forecast because of the narrow subtropical ridge and the objective guidance which kept suggesting recurvature. Seth brushed by Saipan on the 3rd and while no fatalities were reported, significant property and crop damage occurred. Families were evacuated from low-lying areas, and 9.5 inches of rain caused widespread flooding

within 800 nautical miles (1480 km) of Super Typhoon Seth (26W) on the 10th, before recurving northeastward the following day. As Verne became extratropical, Wilda (29W) got started in the western Caroline Islands. Tropical Storm Wilda was another midget tropical cyclone, and posed a serious threat to the central Philippine Islands which had been devastated by Tropical Storm Thelma (27W) only 2 weeks before. Wilda maintained its peak intensity of 45 knots (23 m/sec) as it tracked across southern Luzon and passed about 40 nautical miles (75 km) south of Manila around noon on the 17th. Due to its compact wind field, damage was minimal near Manila. After turning northwestward later on the 17th, Wilda began to weaken, and 2 days later, the residual low-level circulation drifted southwestward with the prevailing northeast monsoon. By the time Wilda had dissipated, Yuri (30W) had formed in the southern Marshall Islands and was slowly intensifying.

Super Typhoon Yuri was the most intense tropical cyclone of the year, with maximum sustained winds estimated at 150 knots (77 m/sec) and an estimated minimum sea-level pressure of 885 millibars. It also was the most intense cyclone to pass within 60 nautical miles (110 km) of Guam since Typhoon Karen (1962). Waves in excess of 30 feet (12 m) battered the southeast coastline and damage on Guam was estimated at $33 million. Yuri's steady rate of intensification to a super typhoon without an episode of explosive deepening was unusual. Yuri was also the largest typhoon to affect the western North Pacific in many years, growing to a diameter of over 900 nautical miles (1665 km) 1 day after passing Guam. As Yuri bore down on Guam, Zelda (31W) developed in low latitudes near the International Dateline.

Typhoon Zelda was the last tropical cyclone of the year, and the fifth midget. Intensification during the early stages of its development was overlooked because of its very small size. Zelda caused considerable damage to the lightly constructed buildings and homes on Kwajalein and the nearby islands and atolls, and caused several injuries to the inhabitants.

Joint Typhoon Warning Center

The Joint Typhoon Warning Center's summary for the Mariners Weather Log has appeared every year since 1959 (the 1958 summary). They have been one of the best and most important contributors to the Log. This summary, however, is just a sample of the wealth of information that is contained in the Joint Typhoon Warning Center's Annual Tropical Cyclone Report. This informative report contains information on warnings, fixes, forecasting details, and specific detailed information for each tropical cyclone including the North Indian Ocean, South Indian Ocean, and South Pacific Ocean. Copies of these detailed reports are available from

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161

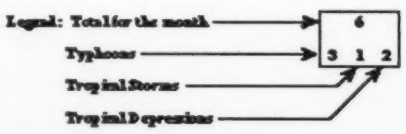
WESTERN NORTH PACIFIC TROPICAL CYCLONE DISTRIBUTION

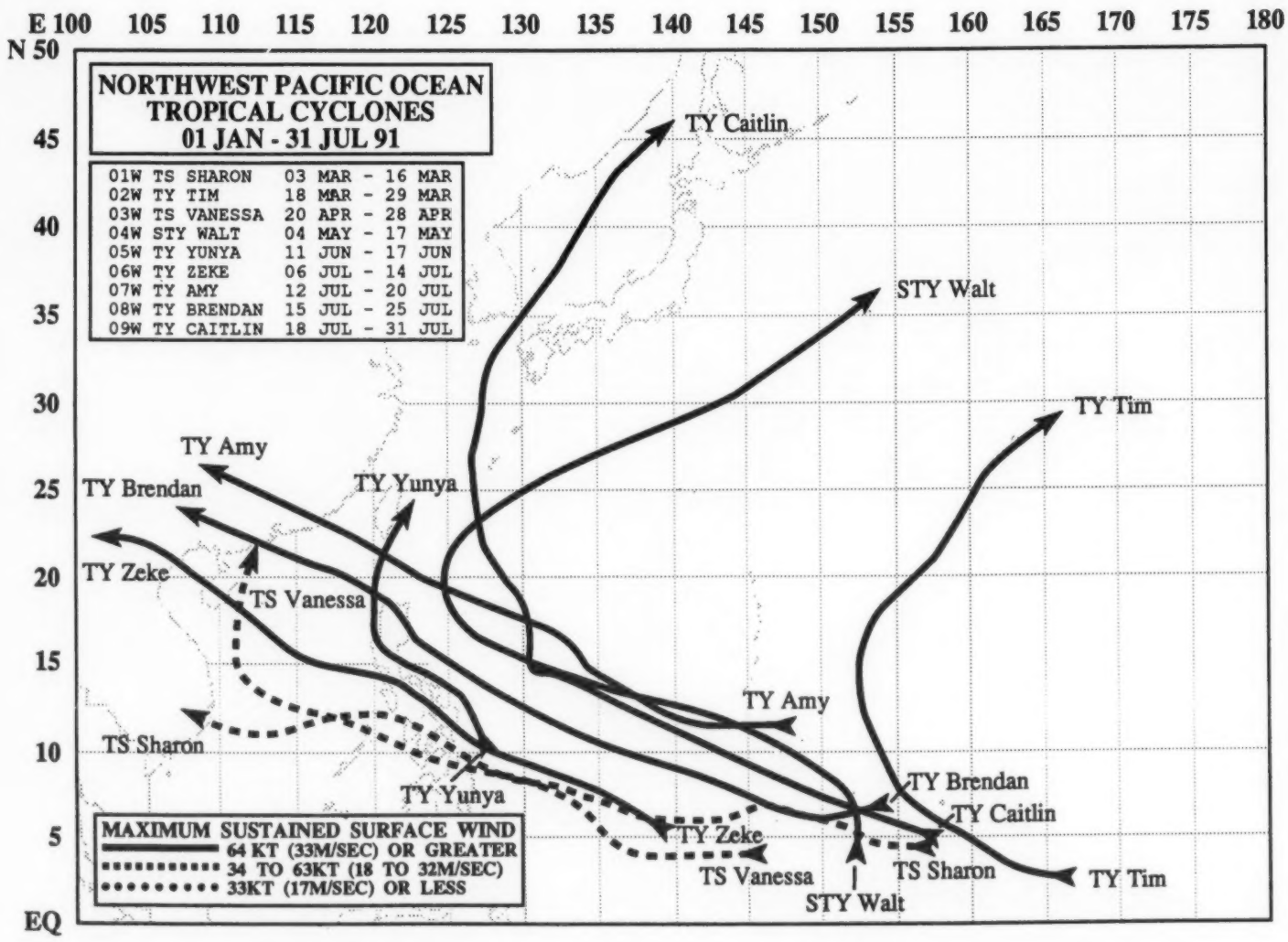
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTALS		
1959	0	1	1	1	0	1	3	8	9	3	2	2	31		
	000	010	010	100	000	001	111	512	423	210	200	200	17	7	7
1960	1	0	1	1	1	3	3	9	5	4	1	1	30		
	001	000	001	100	010	210	210	810	041	400	100	100	19	8	3
1961	1	1	1	1	4	6	5	7	6	7	2	1	42		
	010	010	100	010	211	114	320	313	510	322	101	100	20	11	11
1962	0	1	0	1	3	0	8	8	7	5	4	2	39		
	000	010	000	100	201	000	512	701	313	311	301	020	24	6	9
1963	0	0	1	1	0	4	5	4	4	6	0	3	28		
	000	000	001	100	000	310	311	301	220	510	000	210	19	6	3
1964	0	0	0	0	3	2	8	8	8	7	6	2	44		
	000	000	000	000	201	200	611	350	521	331	420	101	26	13	5
1965	2	2	1	1	2	4	6	7	9	3	2	1	40		
	110	020	010	100	101	310	411	322	531	201	110	010	21	13	6
1966	0	0	0	1	2	1	4	9	10	4	5	2	38		
	000	000	000	100	200	100	310	531	532	112	122	101	20	10	8
1967	1	0	2	1	1	1	8	10	8	4	4	1	41		
	010	000	110	100	010	100	332	343	530	211	400	010	20	15	6
1968	0	1	0	1	0	4	3	8	4	6	4	0	31		
	000	001	000	100	000	202	120	341	400	510	400	000	20	7	4
1969	1	0	1	1	0	0	3	3	6	5	2	1	23		
	100	000	010	100	000	000	210	210	204	410	110	010	13	6	4
1970	0	1	0	0	0	2	3	7	4	6	4	0	27		
	000	100	000	000	000	110	021	421	220	321	130	000	12	12	3
1971	1	0	1	2	5	2	8	5	7	4	2	0	37		
	010	000	010	200	230	200	620	311	511	310	110	000	24	11	2
1972	1	0	1	0	0	4	5	5	6	5	2	3	32		
	100	000	001	000	000	220	410	320	411	410	200	210	22	8	2
1973	0	0	0	0	0	0	7	6	3	4	3	0	23		
	000	000	000	000	000	000	430	231	201	400	030	000	12	9	2
1974	1	0	1	1	1	4	5	7	5	4	4	2	35		
	010	000	010	010	100	121	230	232	320	400	220	020	15	17	3
1975	1	0	0	1	0	0	1	6	5	6	3	2	25		
	100	000	000	001	000	000	010	411	410	321	210	002	14	6	5
1976	1	1	0	2	2	2	4	4	5	0	2	2	25		
	100	010	000	110	200	200	220	130	410	000	110	020	14	11	0
1977	0	0	1	0	1	1	4	2	5	4	2	1	21		
	000	000	010	000	001	010	301	020	230	310	200	100	11	8	2
1978	1	0	0	1	0	3	4	8	4	7	4	0	32		
	010	000	000	100	000	030	310	341	310	412	121	000	15	13	4
1979	1	0	1	1	2	0	5	4	6	3	2	3	28		
	100	000	100	100	011	000	221	202	330	210	110	111	14	9	5
1980	0	0	1	1	4	1	5	3	7	4	1	1	28		
	000	000	001	010	220	010	311	201	511	220	100	010	15	9	4
1981	0	0	1	1	1	2	5	8	4	2	3	2	29		
	000	000	100	010	010	200	230	251	400	110	210	200	16	12	1
1982	0	0	3	0	1	3	4	5	6	4	1	1	28		
	000	000	210	000	100	120	220	500	321	301	100	100	19	7	2
1983	0	0	0	0	0	1	3	6	3	5	5	2	25		
	000	000	000	000	000	010	300	231	111	320	320	020	12	11	2
1984	0	0	0	0	0	2	5	7	4	8	3	1	30		
	000	000	000	000	000	020	410	232	130	521	300	100	16	11	3
1985	2	0	0	0	1	3	1	7	5	5	1	2	27		
	020	000	000	000	100	201	100	520	320	410	010	110	17	9	1
1986	0	1	0	1	2	2	2	5	2	5	4	3	27		
	000	100	000	100	110	110	200	410	200	320	220	210	19	8	0
1987	1	0	0	1	0	2	4	4	7	2	3	1	25		
	100	000	000	010	000	110	400	310	511	200	120	100	18	6	1
1988	1	0	0	0	1	3	2	5	8	4	2	1	27		
	100	000	000	000	100	111	110	230	260	400	200	010	14	12	1
1989	1	0	0	1	2	2	6	8	4	6	3	2	35		
	010	000	000	100	200	110	231	332	220	600	300	101	21	10	4
1990	1	0	0	0	2	4	4	5	5	5	4	1	32		
	100	000	000	000	110	211	220	500	410	230	310	100	21	10	1
1991	0	0	2	1	1	1	4	8	6	3	6	0	32		
	000	000	110	010	100	100	400	332	420	300	330	000	20	10	2
(1959-1991)															
MEAN:	0.6	0.3	0.6	0.7	1.3	2.1	4.5	6.2	5.7	4.5	2.9	1.4	30.8		
CASES:	19	9	20	24	42	70	148	206	187	150	96	46	1017		

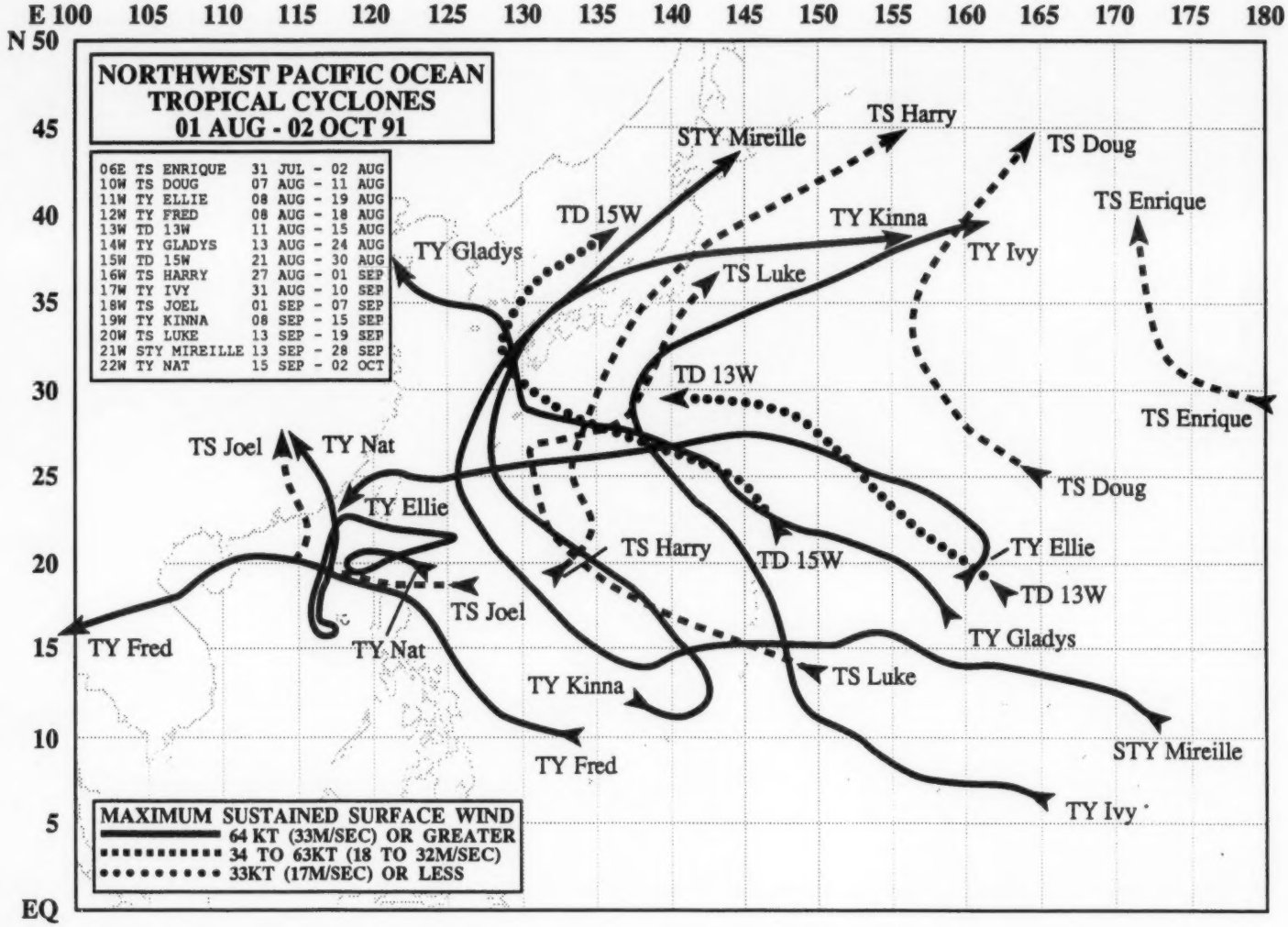
The criteria used in Table 3-2 are as follows:

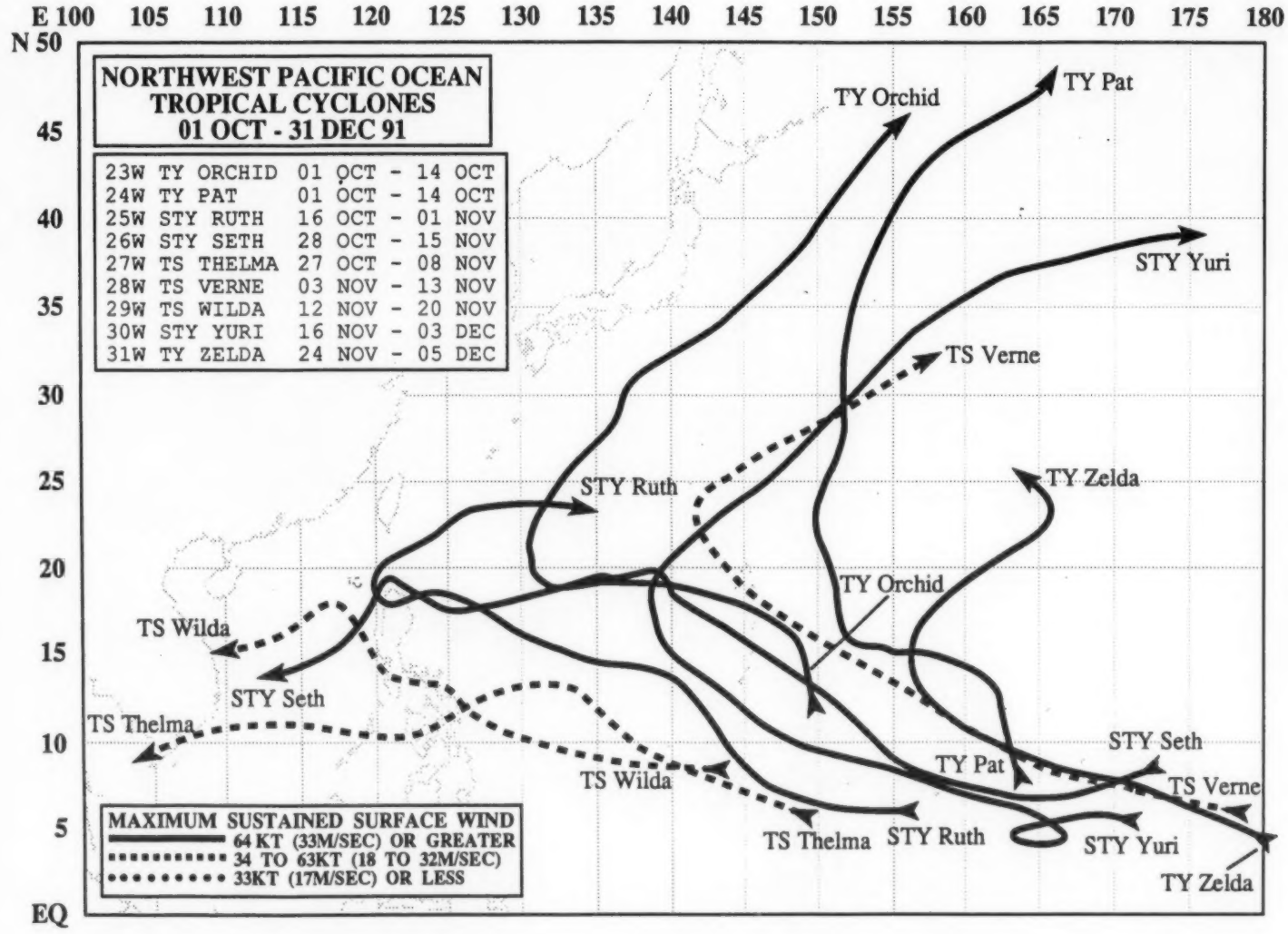
1. If a tropical cyclone warning was issued during the last two days of a particular month and continued into the next month for longer than two days, then that system was attributed to the second month.
2. If a tropical cyclone warning was issued prior to the last two days of a month, it was attributed to the first month, regardless of how long the system lasted.
3. If a tropical cyclone began on the last day of the month and ended on the first day of the next month, that system was attributed to the first month. However, if a tropical cyclone began on the last day of the month and continued into the next month for only two days, then it was attributed to the second month.

LEGEND




E 100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180
N 50
45
40
35
30
25
20
15
10
5
EQ
NORTHWEST PACIFIC OCEAN
TROPICAL CYCLONES
01 JAN - 31 JUL 91
01W TS SHARON 03 MAR - 16 MAR
02W TY TIM 18 MAR - 29 MAR
03W TS VANESSA 20 APR - 28 APR
04W STY WALT 04 MAY - 17 MAY
05W TY YUNYA 11 JUN - 17 JUN
06W TY ZEKE 06 JUL - 14 JUL
07W TY AMY 12 JUL - 20 JUL
08W TY BRENDAN 15 JUL - 25 JUL
09W TY CAITLIN 18 JUL - 31 JUL
TY Caitlin
STY Walt
TY Tim
TY Amy
TY Brendan
TY Yunya
TY Zeke
TS Vanessa
TS Sharon
MAXIMUM SUSTAINED SURFACE WIND
64 KT (33M/SEC) OR GREATER
34 TO 63KT (18 TO 32M/SEC)
33KT (17M/SEC) OR LESS


NORTHWEST PACIFIC OCEAN
TROPICAL CYCLONES
01 AUG - 02 OCT 91
06E TS ENRIQUE 31 JUL - 02 AUG
10W TS DOUG 07 AUG - 11 AUG
11W TY ELLIE 08 AUG - 19 AUG
12W TY FRED 08 AUG - 18 AUG
13W TD 13W 11 AUG - 15 AUG
14W TY GLADYS 13 AUG - 24 AUG
15W TD 15W 21 AUG - 30 AUG
16W TS HARRY 27 AUG - 01 SEP
17W TY IVY 31 AUG - 10 SEP
18W TS JOEL 01 SEP - 07 SEP
19W TY KINNA 08 SEP - 15 SEP
20W TS LUKE 13 SEP - 19 SEP
21W STY MIREILLE 13 SEP - 28 SEP
22W TY NAT 15 SEP - 02 OCT
MAXIMUM SUSTAINED SURFACE WIND
64 KT (33M/SEC) OR GREATER
34 TO 63KT (18 TO 32M/SEC)
33KT (17M/SEC) OR LESS
E 100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180
N 50 45 40 35 30 25 20 15 10 5 EQ
TY Gladys
TD 15W
STY Mireille
TS Harry
TS Doug
TY Kinna
TS Enrique
TY Ivy
TS Luke
TD 13W
TS Enrique
TS Joel
TY Nat
TS Doug
TY Ellie
TS Harry
TD 15W
TY Ellie
TD 13W
TS Joel
TY Gladys
TY Fred
TY Nat
TS Luke
TY Kinna
STY Mireille
TY Fred
TY Ivy


E 100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180
N 50
45
40
35
30
25
20
15
10
5
EQ
NORTHWEST PACIFIC OCEAN
TROPICAL CYCLONES
01 OCT - 31 DEC 91
23W TY ORCHID 01 OCT - 14 OCT
24W TY PAT 01 OCT - 14 OCT
25W STY RUTH 16 OCT - 01 NOV
26W STY SETH 28 OCT - 15 NOV
27W TS THELMA 27 OCT - 08 NOV
28W TS VERNE 03 NOV - 13 NOV
29W TS WILDA 12 NOV - 20 NOV
30W STY YURI 16 NOV - 03 DEC
31W TY ZELDA 24 NOV - 05 DEC
TY Orchid
TY Pat
STY Yuri
TS Verne
STY Ruth
TY Zelda
TY Orchid
TS Wilda
STY Seth
TS Thelma
STY Seth
TY Pat
TS Verne
TS Wilda
TS Thelma
STY Ruth
STY Yuri
TY Zelda
MAXIMUM SUSTAINED SURFACE WIND
64 KT (33M/SEC) OR GREATER
34 TO 63KT (18 TO 32M/SEC)
33KT (17M/SEC) OR LESS

Fire Island Lighthouse

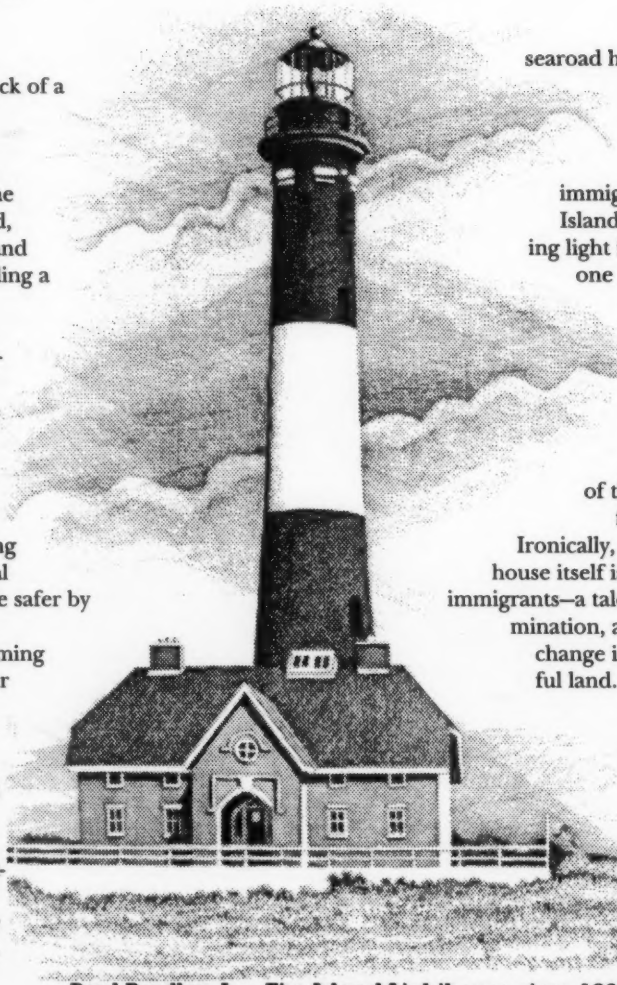
Elinor De Wire
Mystic Seaport Museum

Viewed from the deck of a ship, lofty Fire Island Lighthouse dominates the beach on the south shore of Long Island, sporting a cheerful black and white daymark and extending a bright welcome to the traveler headed into New York Harbor. It has greeted millions of sojourners during its 167 years of service, from pioneers to cruise ship passengers, fishermen to ferrymen, sailors to soldiers. Whether departing, coming home, or working the local waters, their trip was made safer by this well-known seamark.

For my father, coming home on a troop ship after World War II, the first glimpse of Fire Island Light was an emotional experience. As its lantern inched over the horizon and flashed a grateful salute to the returning veterans, a cheer went up, and some cried. Not only was the lighthouse a long-awaited signpost on the searoad home, it was also an inspiring reminder of the values Americans had fought to preserve. Many an uncertain immigrant has also seen Fire Island Lighthouse as a reassuring light in the dark night, and one of hope for a bright future in America.

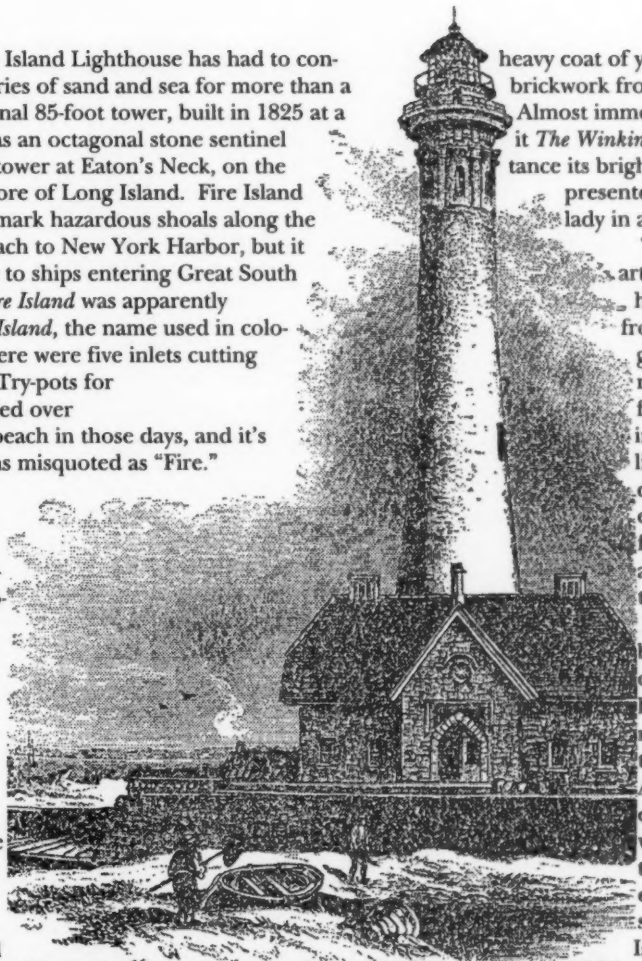
Prior to the appearance of the Statue of Liberty in New York Harbor in 1886, Fire Island Light was the first glimpse of the "American Dream" for most newcomers. Ironically, the story of the lighthouse itself is much like that of the immigrants—a tale of opportunity, determination, and adjustment to change in a strange but wonderful land.

Tall, masonry towers are not ideal structures for an unstable and windy barrier beach such as Fire Island. A massive pillar of bricks—800,000 in all—towering 170-feet above the



Paul Bradley Jr.—Fire Island Lighthouse circa 1985

golden dunes, Fire Island Lighthouse has had to contend with the vagaries of sand and sea for more than a century. The original 85-foot tower, built in 1825 at a cost of $10,000, was an octagonal stone sentinel much like the old tower at Eaton's Neck, on the sheltered north shore of Long Island. Fire Island Light was built to mark hazardous shoals along the open ocean approach to New York Harbor, but it also gave guidance to ships entering Great South Bay. The name F*ire Island* was apparently derived from *Five Island*, the name used in colonial times when there were five inlets cutting across the island. Try-pots for whale blubber boiled over open fires on the beach in those days, and it's probable "Five" was misquoted as "Fire."



Harper's Magazine—Fire Island Lighthouse circa 1885

In 1858 the old tower, nearly undermined by erosion, had to be demolished, both for safety reasons and because mariners felt its beacon was too low to be seen a safe distance at sea. A taller, more impressive lighthouse was built 200-yards northeast of the original site. It was given a heavy coat of yellow paint to protect the brickwork from the constant sandblast. Almost immediately, sailors began calling it *The Winking Woman* because from a distance its bright daymark and flared base presented an image of a statuesque lady in a long, yellow dress.

There was also a state-of-the-art prism lens in the new lighthouse, recently purchased from France and of much greater brilliancy than the old reflector system used in the first tower. Keepers had to install white draperies in the light room to shield the lens during the daylight hours; otherwise it could direct magnified sunlight into the brush and pine groves surrounding the compound and start a fire. In 1871 the second tower began to show signs of deterioration, so the government had the entire exterior of the masonry column sealed in a thick layer of Portland cement. A few years later it was painted in the distinctive black and white bands it still wears today. This daymark is more easily seen against the beige sand and distinguishes Fire Island Light from other towers in the area. Also about this

This penny postcard shows Fire Island Lighthouse by night. It was produced by the Illustrated Post Card Co. of New York. At right is a shot of the lighthouse taken on July 13, 1898. In the foreground is part of the lifesaving station that was in use at the time. Below right is a modern photograph of the light taken by the author at the 1986 ceremony.

time an electrical generator was installed, making this one of the first American lighthouses powered by electricity. For reasons not known, the system was removed after only a few months and replaced by an incandescent oil vapor apparatus. Electricity was not reinstated until 1939 when a submarine cable was laid from the mainland.

Duty at Fire Island was *preferred* by lightkeepers and their families. Except for the intermittent pummelings by storm waves, and the poor soil for gardening and grazing livestock, the island was an idyllic place to live. New York City's bustle and excitement was only a boat ride away from the serenity and beauty of Fire Island's lonely miles of beach. The lightkeepers were highly respected for their solicitous work, since the sea occasionally cast ashore gruesome evidence of the need for lighthouses and lifesavers. Shipwreck losses were made more bearable by the presence of the rugged surfmen and beach horses of the island's lifesaving stations.

Fire Island Lighthouse served faithfully until 1973, when its duties were taken over by a flash tube array of lights on the Fire Island National Seashore water tower. The lighthouse was abandoned and began to deteriorate from lack of care and vandalism. In 1981 the National Park Service obtained custody of the tower, and funds were raised for its restoration through the incorporation of the Fire Island Lighthouse Preservation Society. By 1986 enough work had been accomplished to open a small museum in the keeper's quarters and relight the beacon. An emotional ceremony attended by some 800 boats and a number of dignitaries and celebrities marked the joyous rekindling of this old and much-loved landmark.

I was fortunate to be among the honored guests aboard the flagship ***Evening Star*** that night and spoke with several descendants of the lighthouse's civilian keepers. Peter Nappi, then 14 years old, told me how proud he felt to be present as a representative for his great-great-great-great-great grandfather—the station's first keeper!

Grace Humes of Long Island remembered living at Fire Island Lighthouse as a child shortly after the turn of the century. Lightkeeping blood ran true in her family: Her father, grandfather, and great-grandfather had kept this light, and she recalled climbing the tower's 192 stairs to tend the beacon herself or to help her mother, who stood in when her father had to be away or when the assistant keeper got drunk.

According to Grace, "Not all of them [keepers] were saints." But of her father she said, "He was a good, hardworking man and well-liked by everyone."

Grace also remembered the tower being struck by lightning, which hit the ball on the cupola, burned through the roof, and made the 170-foot trip down the stairway to the house. Fortunately, no one was injured, but the powerful stroke knocked out the new telephone system. With the typical good humor of a lighthouse keeper's daughter, Grace remarked that this event reminded everyone "how much a tall

National Archives

Elinor DeWire

lighthouse tempts the powers of heaven."

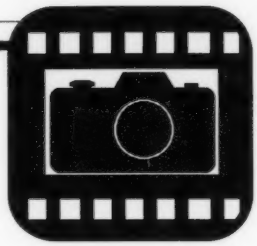
One of the goals expressed by preservationists at the historic relighting ceremony was to restore the exterior of the tower. The concrete covering was peeling off, and the banded daymark had faded. "The Winking Woman needs a new dress!" one society member enthusiastically told everyone.

Today, the lighthouse proudly wears a fashionable gown of black and white, and its beacon remains shining as a sentry for vessels, large and small. The society hopes to keep the museum open and to continue giving tours of the tower, which affords a seagull's view of the counterpane of sand and sea around Long Island. Their efforts have paid off handsomely in many ways, but especially in the living heritage that has been returned to the region.

For information on museum hours and tours of the lighthouse, contact:

Fire Island National Seashore
120 Laurel St.
Patchogue, NY 11772

or call:
(516) 289–4810.



Chicamacomico

Michael Halminski

Most everyone that visits Hatteras Island, North Carolina, admires the Chicamacomico Lifesaving Station in the village of Rodanthe, where it has stood vigilantly since 1911. The station's distinguished history dates back to the early days of the Lifesaving Service of 1874. In its day the station played a significant part in the spectacular story of ship rescues on the Outer Banks, but since the station was decommissioned in 1954, it has lain abandoned and become more and more dilapidated over the years.

The idea to restore the building and open it as museum of the Lifesaving Service had been kicked around since the 1950s; however, there were many stumbling blocks, such as ownership, funding, and guidance. In 1974 after some years of disorder, a group of local citizens formed the Chicamacomico Historical Association, a non-profit organization with the goal of acquiring, restoring, and maintaining a museum of the Lifesaving Service.

The association's formative years were strained, and at times controversial, but the main part of the complex was eventually acquired. The association was experiencing leadership problems and the outlook seemed gloomy for Chicamacomico. Things brightened, however, in 1982, when Jim Henry, a former federal employee who had retired to the nearby village of Waves, was elected by the board of directors to the unenviable position of president of the association. Jim had interests in the Outer Banks since 1956, and had spent a career dealing with government bureaucracy in Washington. He had the experience, time, and ability and was the perfect man for the job.

As a struggling photographer, the station had always been one of my favorite subjects. I had the good fortune to live next door to it for a number of years and spent many hours wandering the premises. This is where I got to know Jim. In the spring of 1983, he commissioned me to construct exhibits of old photographs of the Lifesaving Service to mount in the station, and then surprised me by inviting me to join the board of directors in restoration efforts.

Jim worked to spread interest in Chicamacomico. He wrote letters, grant applications, made phone calls and organized the workings of the association, as well as spending countless hours greeting visitors. Often he would complain that he had retired to a full time job, but in time his hard work paid off. Funds were raised through volunteer efforts, state and federal grants, and individual contributions. The leaky, wooden roof was replaced, exhibits mounted, and Chicamacomico was opened to the public. The dream was beginning to be realized.

Today over $150,000 has gone into restoration efforts, and thousands of people visit the station each year. Our premier exhibit is a reenactment of a beach apparatus drill, which involves a rescue technique employing a Lyle gun and breeches buoy. This program is conducted in cooperation with the National Park Service throughout the summer months.

The task, however, is far from over. Some exterior renovation and maintenance are necessary, and interior restoration costs are still estimated at over $70,000. The association continues to seek exhibit material and memorabilia relating to the Lifesaving Service and the United States Coast Guard for display in the station.

Our goals were made more difficult when the Chicamacomico Historical Association lost a driving force. My close friend and Chicamacomico's, Jim Henry, passed away last April. We miss him, yet we still feel his influence. Thanks to Jim the dream of Chicamacomico as a restored museum of the Lifesaving Service is on a steady course.

The Chicamacomico Lifesaving Station (above) as can be seen in 1992. This is an east view and a good shot of the restoration. The station, established in 1874, was one of seven on the Outer Banks. These buildings survive as one of the most complete U.S. Lifesaving Service/Coast Guard Station complexes on the Atlantic Coast. To the right is Jim Henry in 1989, standing alongside the 28–foot surfboat that was used in the historic Mirlo rescue of 1918. This rescue is a separate story in itself, as Captain John Allen Midgett and his crew saved crewmen from the Mirlo amidst a blazing inferno worsened by gale force winds.

To find out more about the Chicamacomico Lifesaving Station and become a lifesaver, please write to

Chicamacomico Historical Association, Inc
P.O. Box 5
Rodanthe, NC 27968

Is there Still a Lifesaving Service in England?

Mary Reed

One of the writer's enduring memories of the time when she lived in England is the measured tones of the B.B.C. Radio announcer as he read the shipping forecast just before the 6 p.m. news. The names were a roll-call of the sea: Hebrides, Rockall, Lundy, Fastnet, Shannon, Sole, Finisterre, Fair Isle, Cromarty, Dogger, Tyne, Dover, Portland–and all of them of vital concern to men at sea.

Even with advance warnings, however, ships founder, and lifeboats must be launched. Yet incredibly, as late as the eighteenth century (although lifeboats built specifically for lifesaving existed, as opposed to boats pressed into service when needed) there was practically nothing by way of coordinated efforts to save shipwrecked people, and certainly no national organization to carry out this work.

In 1824 following the publication of *An Appeal to the British Nation* by Sir William Hillary, who lived on the Isle of Man and had himself helped rescue more than 100 people, the *National Institution for the Preservation of Life from Shipwreck* was formed. It was organized on a purely voluntary basis at that time, when it appeared that the government was ignoring the problem. In 1854 the name was changed to the *Royal National Lifeboat Institution* (by which title it is still known), and voluntary contributions having declined, the Institution was granted a Board of Trade subsidy, which also meant government representation on the Management Committee. Eventually, as contributions increased, this subsidy was withdrawn, and the *RNLI* has been completely independent, supported entirely by gifts and various fundraising efforts. A professional salaried staff oversees administration and mechanics maintain the boats, but everyone else–including the lifeboatmen and women donate their services.

A number of different fund-raising events take place annually, including parachute-jumps, rowing-relays, and getting crates of *Noveau Broon* ale from Newcastle-on Tyne, where it is brewed, to Paris. There is even one event where a man allows people to use his shaved head as a notepad. But the best-known of the Institution's fundraisers are their **Flags Days**, whose roots are in the first street collection for charity ever organized. The story of how this came about hinges upon what is regarded as the worst disaster in the history of the Institution.

Frank Kilroy, in his article *1886: The Wreck of the Mexico*, (**The Lifeboat**, journal of the RNLI, Spring 1986) wrote at some length about the case. Summarizing, on December 9th, 1886, the German barque ***Mexico*** was wrecked in the Ribble Estuary on the northwest coast of England. The Southport lifeboat, the ***Eliza Fernley***, was launched but capsized and all but two of the crew were lost. Ironically, it is possible that by the time the ***Eliza Fernley*** reached the ***Mexico***, the lat-

Mary Reed is from England and has lived in the U.S. since 1976. Mary writes regularly for **Weatherwise**. This piece originally part of *Lifeboat Day in England* nicely answers the question and we thank her for it.

Engraving after painting by J. W. Carmichael

On the night of September 6, 1838, the paddle steamship ***Forfarshire*** *ran aground in the Farne Islands. Grace Darling and her father, who was the lightkeeper at Longstone Lighthouse, rowed a small open boat into the howling wind and raging sea, after spotting some survivors. Normally it took three men to handle the boat in such conditions. They managed to reach the sea-swept rocks and found nine weary people. Grace managed to hold the boat in position while her father organized the rescue. They took four men and a woman on the first trip, and then her father and two other men returned for the remaining men. Unbeknownst to them at the time, some 40 people died in the tragedy. When word of this deed got out Grace became a national heroine.*

ter's crew had already been rescued by the Lytham lifeboat, the ***Charles Biggs*** – communications at that time being very rudimentary. About half an hour before the launching of the ***Eliza Fernley***, the St. Annes' boat, the ***Laura Janet***, went out. What happened to the ***Laura Janet*** was never established, but she foundered and most of her crew was found washed up on shore. Of the 44 men who had gone out to rescue the ***Mexico***, 27 died, leaving 16 wives with 50 children among them.

During the night, crowds of relatives had gathered in St. Annes at the home of Charles Macara, a member of the town's lifeboat committee and owner of the only telephone in St. Annes. He dispatched telegrams up and down the coast for news but with no result. Yet another tragedy was narrowly averted when the Blackpool lifeboat, the ***Samuel Fletcher***, was launched after receipt of one of Macara's telegrams. One of the men was swept overboard, but fortunately he was pulled back aboard.

A disaster fund was set up for the widows and orphans, eventually totaling some £50,000. Realizing that the Institution's fundraising depended largely upon a wealthy few, Macara decided to bring lifeboats to the attention of the ordinary person, and in October 1891, he organized the first *Lifeboat Saturday*, held in Manchester.

On that day, lifeboats from St. Annes and Southport were pulled through the streets, and collectors went around, some carrying purses on poles (the better to reach people looking out of windows or sitting upstairs in trams), and took donations. This is said to have been the first such street collection, an idea which has since been adopted by many charities.

Nowadays collectors carry lifeboat shaped boxes. Originally they distributed small lifeboat shaped lapel badges, affixed to the clothes with pins, in return for contributions. Lifeboat days and weeks vary from city, to city coastal resorts tending to hold theirs in the summer (when there are a lot of visitors) and inland cities having theirs in the winter. The most important one by far is the London collection, which takes place in the middle of March each year.

A number of observances marked the centennial of the wreck of the ***Mexico***: a display of lifeboats at Lytham, a procession of lifeboats and displays at St. Annes, and an open air service near the memorial to the ***Mexico*** disaster, which was erected in St. Annes in 1888.

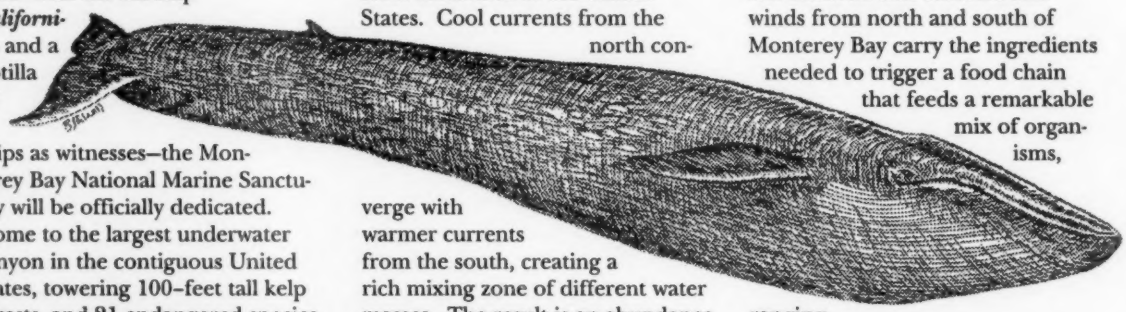
As to the ultimate fate of the ***Mexico*** herself, she was salvaged, and after being displayed off Lytham for 2 years, re-rigged and sold. She did not however escape her destiny, for in 1900, as the ***Valhalla***, she was again wrecked, and became a total loss. Thanks to gallant men and women of the Royal National Lifeboat Institution, however, those who venture on the sea can be helped if ever the melancholy need for it should arise.

Monterey Bay Marine Sanctuary

Justin Kenney
National Ocean Service

Every year the nation celebrates CoastWeeks, a grassroots observance of the coast. Communities and private organizations sponsor classroom projects, nature walks, beach clean-ups, environmental lectures and workshops, and marine lab open houses. This year's celebration in central California will take on special significance.

On September 20th—with the tall ship ***Californian*** and a flotilla of ships as witnesses—the Monterey Bay National Marine Sanctuary will be officially dedicated. Home to the largest underwater canyon in the contiguous United States, towering 100-feet tall kelp forests, and 21 endangered species, it is easy to understand the excitement surrounding our nation's newest marine sanctuary.

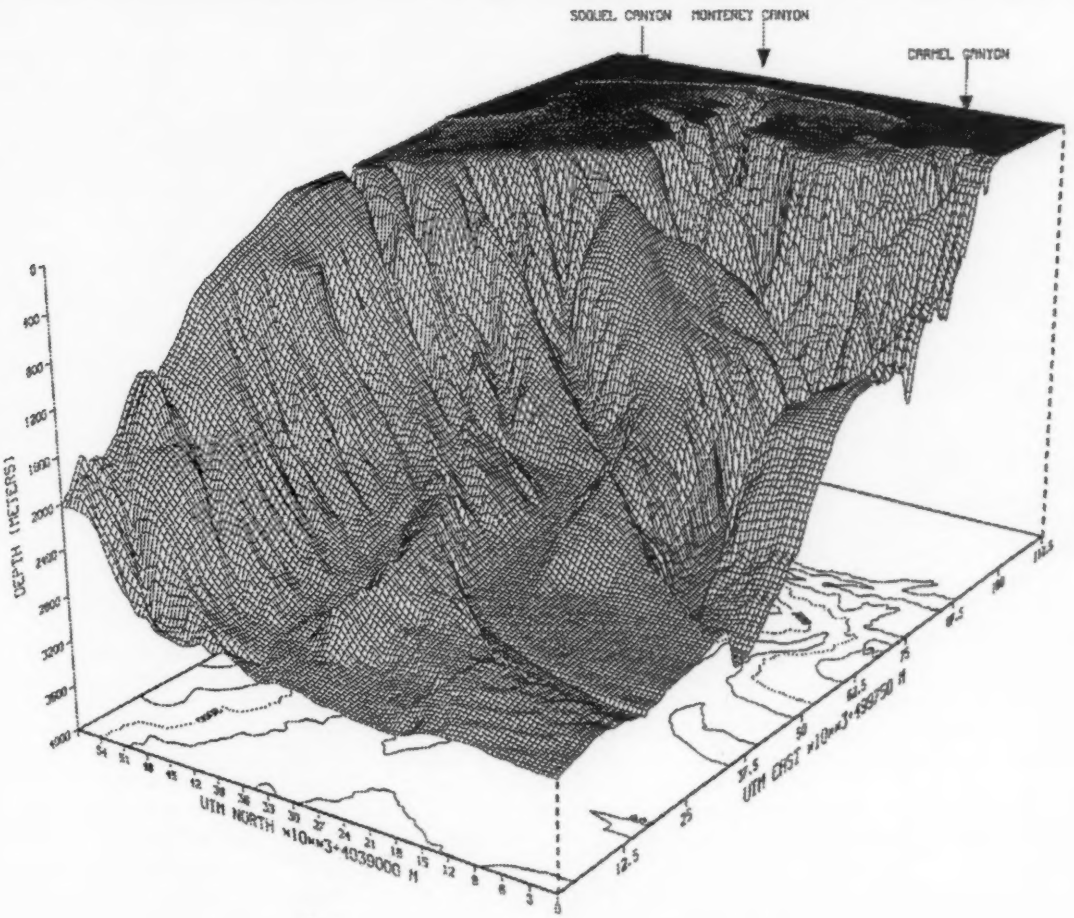


Covering an area larger than the state of Connecticut, the sanctuary extends from the southern boundary of the Gulf of Farallones National Marine Sanctuary, southward along 348 nautical miles of shoreline, past San Simeon Creek to Cambria Rock. The boundary extends seaward from the high tide mark for up to 20 miles.

The Monterey Bay region has long been noted as one of the most biodiverse in the United States. Cool currents from the north converge with warmer currents from the south, creating a rich mixing zone of different water masses. The result is an abundance of warm and cold water species and a diverse blend of habitats within a relatively small area.

Only a few hundred yards off Moss Landing lies Monterey Canyon. Reaching depths of 10,000 feet and covering 676 square nautical miles, this submarine trench is even larger than the Grand Canyon.

Recent satellite imagery dispels the belief that the canyon floor facilitates pumping of cold, nutrient-rich waters from the ocean floor to the surface—a phenomenon called upwelling. Instead it is believed that currents and winds from north and south of Monterey Bay carry the ingredients needed to trigger a food chain that feeds a remarkable mix of organisms, ranging from microscopic plankton to Earth's largest creature, the endangered blue whale.



The Blue Whale (left) grows up to 98 feet. This sketch was done by Bonnie Dalzell for an article in ***Nature Canada****, Vol. No. 4, Oct./Dec. 1973 entitled* ***Status of the World's Whales****. Above is a three-dimensional profile of the Monterey Canyon and surrounding features. This undersea canyon, the largest in the United States, is larger than the Grand Canyon.*

Fin whales, Pacific white-sided dolphins and, on occasion, the blue shark join the blue whale in patrolling the Canyon's dark and mysterious waters. Although largely unstudied, the benthic community appears to be dominated by invertebrates such as brittle stars and sea urchins. Using the submersible ***Alvin***, US Geological Survey and National Oceanic and Atmospheric Administration (NOAA) workers discovered deep-sea communities nourished by seepages of sulfide and methane-rich fluids.

In contrast to the expanse of Monterey Canyon, every inch in the kelp forest habitat is teeming with life. Kelp is the fastest growing plant in the world, capable of growing up to 2 feet a day and towering to heights of over 100 feet. These submerged floral skyscrapers support biological communities among their protective canopies, along their stem-like stipes, and within their entwined holdfasts. The kelp canopy is a favorite resting spot of the sea otter, which leisurely naps in the protective bed of floating strands. When storms or age dislodge the kelp and it eventually washes ashore, it continues to support communities of invertebrates, crustaceans, and birds.

In addition to these and

NOAA

Sea surface temperature and upwelling information can be gleaned from these June 1989 data obtained from the Advanced Very High Resolution Radiometer Instrument (AVHRR) which are carried aboard TIROS-NINOAA polar orbiting satellites (COAP, NOAA).

other ecosystems, the sanctuary supports research, education, commercial, and leisure activities. Marine scientists benefit from the many habitats in close proximity and 13 research facilities exist in the area. Fishing is big business along California's central coast. Anchovies, salmon, albacore, squid, rockfishes, flatfishes, and bass are important catches. Seaweed, once used as potash for gunpowder, is now harvested for its algin, extracted for use in ice cream, processed foods, pharmaceuticals, toothpaste, and make-up.

The lure of Monterey Bay is not a recent phenomenon. In the early 1800s the Spanish exported hide to New England and tallow to South America. Later, Monterey would thrive as Nantucket whalers discovered the abundance of these waters. The area also experienced periodic military action, from the Mexican War to World War II. Centuries of serving as an important economic and military center, coupled with notoriously unpredictable weather, have resulted in over 1,200 shipwrecked vessels in the area. One of the more famous is the World War II airship USS ***Macon***.

Commissioned by the US Navy as an aircraft carrier, the ***Macon*** (cover) and its hold of four Sparrowhawk fighters fell victim to a violent storm and plummeted into the waters off Point Sur in 1935. Amazingly, rescue efforts were able to save all but two of the 83 crew members. Although well documented since its discovery in June 1990, much remains unknown about the ***Macon*** and its demise. As for the Sparrowhawk fighter planes, worker bees to this 785-foot long hive, only one remains and is currently on display at the Smithsonian.

NOAA Marine Sanctuary Division Historian Bruce Terrell is currently interviewing 73-year old Woody Williamson, a former Sparrowhawk pilot and confidant of Macon Sparrowhawk pilot Rear Admiral Harold B. "Min" Miller. There is only one known living survivor of the ***Macon***, so Williamson's experience as a Sparrowhawk pilot, as well as his personal exchanges with Rear Admiral Miller, are considered valuable in shedding new light on this submerged mystery.

Monterey Bay holds clues to past civilizations as well. Over 700 historic sites have been reported and verified, most of which represent native American resources. Tribes are believed to have migrated to the Monterey Bay area some 12,000 years ago. The most recent group was the Costanoans, who subsisted on the rich resources offered by the shoreline. Today, sand dunes on Año Nuevo Point and Monterey Peninsula contain midden deposits of discarded shells and bones. These deposits read like a diary of Costanoan life—their husbandry, economy, and ability to adapt to the changing landscape. By studying such factors as glacial history, settlement activity, shipping routes, and weather patterns, archaeologists seek to uncover prehistoric and historic cultural artifacts that will give further voice to the area's history and heritage.

Much like a symphony, Monterey Bay can be appreciated for its overall beauty and power and for its quietest nuance. And with each performance, one discovers a new appreciation for the complex web of life it sustains. The designation of Monterey Bay as a national marine sanctuary will ensure that future generations will be able to enjoy nature walks along its coast, discover its sunken secrets, and marvel at the abundance of life contained in its waters.

The *Henry Steinbrenner*

Skip Gillham
Vineland, Ontario

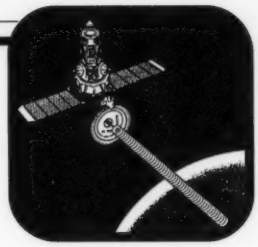
The *Gales of November* are well known prowlers on Lake Superior and indeed all of the Great Lakes. However, at other times dramatically shifting weather conditions have created monstrous seas and led to the loss of numerous unsuspecting vessels. Among the casualties was the ***Henry Steinbrenner***.

This 440-foot long steel bulk carrier was built at Port Huron, Michigan in 1901 and sailed in the grain, ore and coal trades for Kinsman Transit.

Warm springlike weather dominated the Lake Superior region on May 9, 1953, as the ***Henry Steinbrenner*** loaded iron ore at Allouez, Wisconsin for Cleveland. A cold front changed conditions in a hurry, and as the ship steamed out on Lake Superior, the mercury began to plummet. Winds of close to 70 miles per hour and waves between 15 and 20 feet battered the ship, while sheets of rain and then snow limited visibility.

The ship began to take on water and when three hatch covers were washed away, it was evident to all on board that the freighter was doomed. Distress calls were sounded and the Captain called for the crew to abandon ship. This was done at 6:25 a.m. on May 11 some 15 miles off Isle Royale at the western end of the lake. Unfortunately, only 14 sailors lived long enough to be rescued. Another 17 were not as lucky.

Great Lakes Graphics



The Loop Current from Above

Peter J. Celone and Eileen M. Maturi
National Environmental Satellite, Data, and Information Service

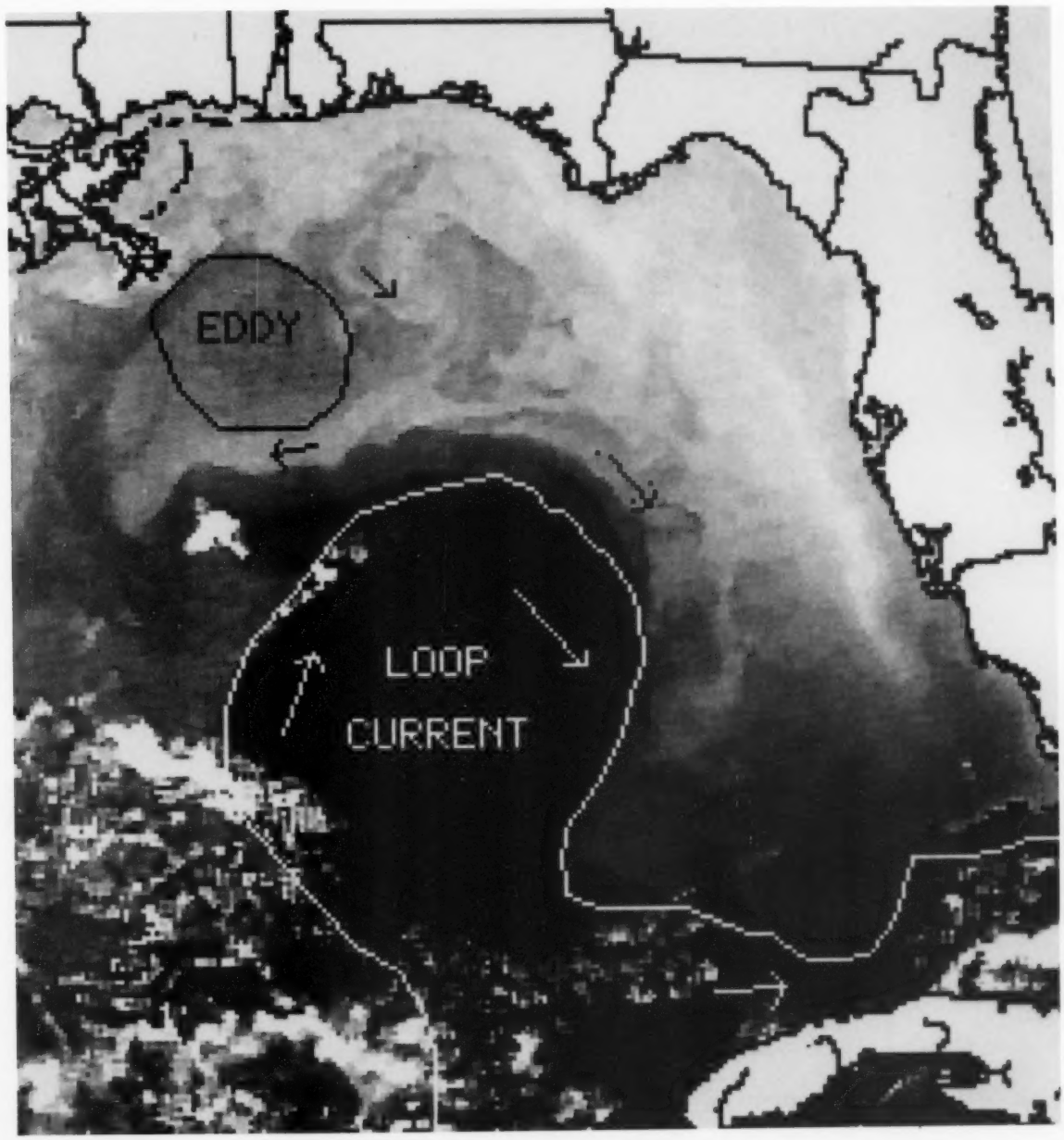
Mariners who must navigate along and through major ocean currents have always sought information on the position and orientation of these ocean features. Environmental satellites provide one way of obtaining the location of these currents and their associated features. Thermal photographs acquired from satellites are used as a tool to produce a *snapshot* of existing oceanographic conditions. Satellite receiving stations worldwide currently access these thermal photographs on a routine basis.

Circulation in the Gulf of Mexico is dominated by the Loop Current, which enters through the Yucatan Straits, and exits through the Straits of Florida where it is known as the Florida Current. In the accompanying photograph, the eastern Gulf of Mexico shows the Loop Current in the form of a large body of warm clockwise-flowing water (black in color), and an associated warm eddy (gray) with cool (light gray/white) continental shelf water flowing clockwise around the eddy. The arrows indicate the direction toward which the flow is moving as opposed to wind indicators which show the direction from which the wind is blowing. Clouds appear as the brightest white patches in the image, an indication of their relatively cold temperatures. The position of the Loop Current varies over time, either following an almost direct path between the Yucatan and Florida Straits, or forming a clockwise flowing loop (as observed in this image). Current velocity within the Loop Current averages between 1 to 2 knots, and associated eddies generally rotate with velocities of less than 1 knot.

Knowing the position of the Loop Current allows the mariner to take advantage of its velocity (arriving at your destination sooner), and usually provides a huge savings in fuel costs, particularly when eastbound over the northern Gulf of Mexico. However, when westbound in these waters this knowledge can be used to stay out of the current, preventing a loss of time. For example, if your vessel is heading to Louisiana from Florida, you want to avoid the strong flow of the Loop Current.

Fishermen like to know the position of the Loop Current, associated warm eddies, and thermal boundaries (areas where there is a quick change in temperature over a short distance, which tend to be rich in nutrients). Fishing along thermal boundaries usually provides higher catch rates than other areas.

The Loop Current, while not as publicized as its Atlantic counterpart the Gulf Stream, is important to those who work or sail the Gulf of Mexico.


EDDY
LOOP
CURRENT

A Friend in New Zealand and More 1991 Awards

Julie Fletcher, MMO New Zealand

Getting to Know Your Know PMO

MWL: Tell us a little bit about your background.

JULIE: I joined New Zealand Meteorological Service (NZMS) in 1978 and spent the first 6 years or so working through the ranks in the National Weather Forecasting Centre, Wellington. I moved off shiftwork when I took the job of Field Officer, which involved visiting all the voluntary rainfall, climate and synoptic stations in the Central New Zealand area, discussing the reporting program with the observers, checking the instruments, and generally encouraging continued reporting. This was an interesting job and took me to some remote places. The move to the Marine Meteorological Officer (MMO) position in 1986 was a natural progression, moving from fieldwork on land to similar work on ships. The ship reporting program is very interesting and I get to meet a wide variety of people of all nationalities on a wide range of vessels and I very much enjoy this.

MWL: I guess you still do a lot of traveling?

JULIE: Being the only New Zealand PMO keeps me busy. I have to travel to a number of ports in order to visit all of the New Zealand voluntary reporting ships. I am based to the north of Wellington and visit the Port of Wellington about three times per week. From time to time, I drive to Maunganui to visit ships which do not call at Wellington. It is only occasionally that I have to go to one of the South Island ports because most of the ships visit at least one of the North Island ports.

MWL: What types of vessels are in your program?

JULIE: There are about 55 ships on the NZMS Voluntary Observing Ship's Register. There is a wide range of vessel types and these include: ferries, cement carriers, tankers, sail training ships, roll on/roll off, general cargo, fisheries research vessels, NZ Naval Ships, and container ships of all sizes.

MWL: Do you see ships from other programs?

JULIE: I routinely visit ships of other voluntary observing programs at the Port of Wellington. At other ports my first priority is to visit NZMS Voluntary Observing Ships, but as time allows I also visit ships of other nations such as Australia, Great Britain and Germany. In lesser numbers I also see ships that report for Japan, Russia, USA, and Canada. I hold supplies of instruments and stationery for British and German Reporting Ships and issue these on behalf of their

meteorological offices to ships which trade in the Pacific region and never go home.

MWL: Do you work with SEAS units?

JULIE: No, we don't have a NZ equivalent of a SEAS unit, but 2 NZMS Observing ships, MV ***American Star*** (ex ***Act 3***) and MV ***Melbourne Star*** (ex ***Act 40***) both have SEAS units on board as supplied by NOAA. Another NZ Observing Ship, MV ***Tangaroa*** was equipped with a Marine Automatic Weather Station (MAWS) in 1991, deployed by NZMS. The computer processes data received from the anemometer, barometer, and temperature sensors and merges it with the ship's position, course and speed from the ship's computer, creating a coded ship observation. The ship's officers have the opportunity to manually enter the visual elements of visibility, cloud type, present weather, swells, etc. to the report before it is automatically transmitted via the GMS satellite Japan. Observations are then sent onto New Zealand via GTS.

MWL: Do you interact with other PMOS?

JULIE: My only opportunity to work with PMOs of other nations is via mail, phone, or fax. (Although I did get the chance to visit the Melbourne PMA, Mike Hills during a visit to Melbourne in 1990). I communicate with Captain Coombs of the British Met Office, Captain Downes, PMO Tilbury, and Mr. Guehne PMO Hamburg with regard to supplies for their ships. Occasionally, I contact Taffy Rowlands, the PMA in Sydney and Mike Hills, the PMA in Melbourne to get assistance with ships calling at their ports.

MWL: Are you involved in other duties as well?

JULIE: Yes, as MMO I manage all areas of the NZMS marine reporting program. This includes both the Voluntary Observing Program for ships and the NZMS Drifting Buoy Program. In the ship program I maintain a register of all NZMS reporting ships, undertake all correspondence with WMO, and other meteorological services, shipping companies, etc. With regard to the marine program, I answer all ship inquiries, determine which new ships are suitable for recruitment and find out about ships leaving New Zealand routes. I remove the instruments, check incoming completed ship's meteorological logs to name a few.

For the Drifting Buoy Program I organize all stages from buoy procurement to deployment. Each year NZMS deploys five buoys in the Tasman Sea. In addition to these, we also deploy up to eight TOGA buoys for the National Data Buoy Center (USA) in an area to the east of New Zealand in the Southern Pacific Ocean. Most of these buoys are deployed by voluntary reporting ships. Without the enthusiastic cooperation of these ships, the buoy program could not be maintained.

MWL: Ship observations must be particularly important to an island nation like New Zealand.

JULIE: As you rightly noted, ship reports are very important for our forecasters. One of our forecasters has a saying "that to ignore a ship ob is to do so at your own peril." Experience has taught him that when a ship observation does not appear to fit the analysis it is most likely the ship observation which is correct and not the other way 'round. NZMS is responsible for forecasting for a large ocean area and relies heavily on ship observations to be able to carry out this function.

MWL: Tell us a little about your family.

JULIE: My partner John and I have been together for 8 years. We live to the north of Wellington and from our home have a lovely view overlooking the Porirua Harbour. John is an instrument engineer and also works for NZMS as Calibration Officer, checking standards and calibration of all the instruments.

MWL: What hobbies do you have?

JULIE: Recreational activities include sailing. We have an 11-ft sailing dinghy which we enjoy sailing in the harbor below our home. I also enjoy a round of golf although I'm not very good. And I'm interested in gardening. I also love travelling and at present am learning to speak Italian in preparation for a trip to Europe in the summer 1993.

MWL: How does being a woman affect your job?

JULIE: When I first started this job and sometimes even now when I visit a ship where I am not known, the reaction is often one of surprise since all the previous PMOs they have come across have been male. In some ways I think that being female enables me to enlist the help of a ship, for say Drifting Buoy Deployments or with regard to recruitment, more easily than a male PMO. I have had a few funny incidents with mistaken identity when I have arrived on board a ship and it has been assumed that I was the nurse or that I had come to do the haircuts.

The Pride of Baltimore takes on SEAS

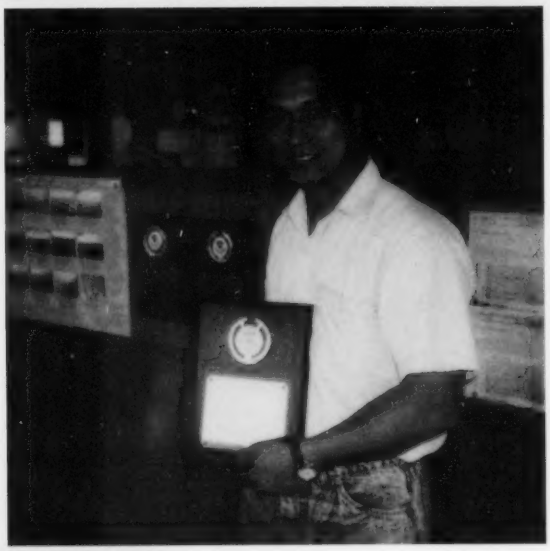
A Shipboard Environmental [data] Acquistion System (SEAS) was recently installed onboard the ***Pride of Baltimore II***, a sailing schooner built in 1987–88 along the lines popular in the early 1800s.

Used by the City of Baltimore for goodwill and international liaison, this summer the ship is engaged in extended cruising in the western North Atlantic and is schedueled for international travel in the fall. The crew (left) consists of Captain Bob Glover, 1st Mate Mark Roesner, 2nd Mate Chuck Ertle, Bos'n Wesley Heerssen, Eng. Doug Leasure, Cook Josh League and Deck Hands Steve Russell, Diane Klair, Steve Osmond, John Seacrest, Peggy Flanigan and Susan Scherer. Standing to the far right in the photograph is the infamous Mariner Observations Program Leader for NWS, Vince Zegowitz (the only one he could identify correctly in the photograph).

The 1991 Awards Continue

The annual VOS Awards for outstanding observations during the past year (1991) are presented to the selected ships when the Port Meteorological Officer visits the vessel. These awards are based upon the overall performance of a vessel's observation program for the year. This is as objective as possible and it is not meant to undervalue any of the vessels that send in observations. The following photographs show some of the latest PMO visits. Receiving a 1991 award on behalf of the ***Golden Gate Bridge*** *are Captain T. Morioke and 3d Engineer Koyama (below, left). Below,right Captain Richard W. Crane accepts the award for his vessel–the* ***Matsonia****. This is the second award in a row for the* ***Matsonia****.*

*The **Atlantic Ocean** (that's the vessel not the basin) was awarded a plaque for its crew's oustanding observing job in 1991. Accepting the award (above, left) from Martin Bonk, Newark PMO was Captain Laptalo (right). Martin also had the pleasure of presenting an award (below, left) to Captain J. G. Van De Westeringh, Master of the **Oleander** (left). The **Oleander** is a favorite here at NODC as many of our employees have enjoyed taking oceanographic observations aboard the ship while traveling to Bermuda and back. The **Oleander** has always been most helpful to NOAA. Another Bonk award (above, right) went to Frank Harty representing Maersk, Inc. for their outstanding contribution to the VOS program in 1991. Below, right hard-hatted Cleveland PMO George Smith presents a 1991 award to the mv **Joseph H. Frantz**. Accepting the award are (left to right) Captain Gary E. Mielke and Mates Bryce Sunderlin and Rik T. Stern. Mates Larry Jeffries and C. Doug Cooley were not in the photo but deserve recognition.*

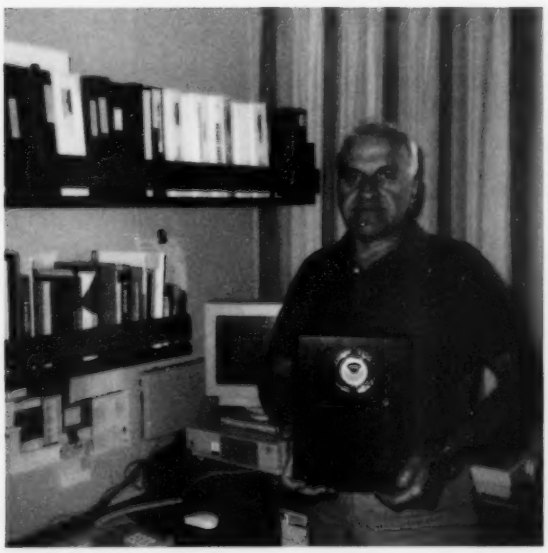


One of our best reporting vessels is the ***Sea-Land Enterprise.*** *Accepting their 1991 award (above, left) are Captain M. Michaelsen (left) and Captain S. Kislinger. Hollywood PMO, Bob Webster (actually it's Los Angeles) presents (below, left) a 1991 award–their third– to Captain Bernard M. Simpson (right) of the mv* ***Polynesia.*** *Another Webster presentation (above, right) went to 3d Officer Joseph C. Castillejos of the mv* ***Ferncroft,*** *also a three-time winner for outstanding observations over the course of an entire year. Unlike PMO Nelson,*

Bob Webster often remains anonymous when presenting awards as seen in his presentation to Captain James H. Anderson of the ***Sea-Land Producer*** (page 54, bottom right).

Also on page 54 (center), Bonk is back; this time to present another well-deserved award to Sea-Land Services, Inc. for their outstanding service to the VOS program in 1991. Present at the ceremony were (left to right) Dick Posthumus, Captain P. Sarandinaki, Martin Bonk, Captain J. Slier, Pat Jackson-Harris, and Nancy Bartulenicz. The photographer was Ginni White of Sea-Land.

On page 55 (top, left) Captain Gary Hurt of the ***President Washington*** *accepts the outstanding award for 1991-the second year in a row for his vessel. Bottom, left the* ***President Polk*** *racks up its first award and accepting the plaque is Captain Bill Brocco. Not to be left out of the action, Houston's favorite PMO, Jim Nelson gives his congratulations (top, right) and an award to Captain William F. Schretzman along with Chief Mate James N. Pappas of the* ***Newark Bay****. Not only did the* ***Newark Bay*** *have a less than .5% error rate for the year, but they transmitted an average of more than two observations per day via INMARSAT while at sea. Below, right Houston's only PMO, Jim Nelson presents a 1991 company award to the Mexican Line in honor of their support of the VOS program.*



Sea or Swell? That is the question.

Martin S. Baron
National Weather Service

Reviewing Sea And Swell Groups $2P_wP_wH_wH_w$, $3d_{w1}d_{w1}d_{w2}d_{w2}$ $4P_{w1}P_{w1}H_{w1}H_{w1}$ $5P_{w2}P_{w2}H_{w2}H_{w2}$)

Wind and waves directly impact many vessel operations – fuel consumption, travel times, the security and handling of cargo, and the safety and comfort of all aboard. The security of the ship's hull and superstructure is also affected. Wind and waves are also important scientifically. The meteorologist must have wind and wave observations to accurately forecast these parameters. The maritime section of the Ships' Synoptic Code, which begins with group $222D_sv_s$ (222 being the maritime data indicator) contains four wave (sea and swell) groups. This allows you to report your local wind-driven sea and up to 2 different observed swells. Three wave characteristics are reported – wave direction, period, and height.

The distinction between sea and swell waves is well known to mariners. Sea waves are waves produced by the local wind, either at the time of observation, or in the recent past. Swell waves are waves that have travelled into your area after being generated by distant winds, sometimes thousands of miles away. In general, swell waves are long in comparison to sea (wind-driven) waves, because swell waves of shorter wavelength have less energy, and tend to dissipate; they don't travel as far as longer swell. The longest swells travel the greatest distances. Long swell waves also travel faster than shorter waves. The speed, in knots, for both sea and swell waves, equals 3.1 times the period (seconds). Wavelength, in meters, equals 1.56 times the square of the period, in seconds. Because of their greater speed, longer swells will travel ahead and often give advance warning of an approaching storm. As swell travels, its height decreases. Investigations have shown that after travelling 1200 miles, a swell will lose half its height.

Avoid Confusing Sea and Swell

There are always some vessels which report very long sea periods, of 8 seconds or more. This is probably swell, rather than sea. Confusion between sea and swell can occur when the local wind direction happens to be with the incoming swell. Seas with very long periods can occur, but only when the wind has been blowing from the same direction for many hours over a long stretch of open sea.

Sea wave direction (not reported) and swell wave direction ($d_{w1}d_{w1}d_{w2}d_{w2}$), like wind direction, is the true direction from which the waves are coming. Sea wave direction is not reported – it's assumed to be the same as the wind direction (dd). Report swell wave direction using the coded wind direction table available from the Ships Code Card, or NWS Observing Handbook No. 1, July 1991 edition, table 3.12.

Occasionally, sea wave direction is not the same as the wind direction. This can happen when wind direction is changing, as when a trough or front passes your vessel. There may be two distinct sets of sea waves, the angle between them being the difference in wind direction on either side of the trough. There is no provision in the synoptic code to report two sets of sea waves. If such a situation exists at the time of observation, the characteristics (period and height) of the best formed sea waves should be reported.

Sea wave period (P_wP_w), and swell wave period ($P_{w1}P_{w1}P_{w2}P_{w2}$) are the time intervals, expressed in sec-

onds, for successive crests, or troughs, to pass a given point. To measure wave period, a stopwatch is desirable. Choose a distinctive patch of foam or a small object floating on the water, and note the time it takes the foam or object to go from one crest to the next. Repeat this procedure until several oscillations have been observed. Calculate and report the average period that you have observed.

There is no code table for period – it is reported in actual seconds.

Sea wave height (H_wH_w), and swell wave height ($H_{w1}H_{w1}H_{w2}H_{w2}$) are measurements of the vertical distance between the top of a crest and the bottom of an adjacent trough. These estimates depend much on the skill and ingenuity of the observer. Use a standard of height, such as the height of a man, bulwark, forecastle, or other well-known dimension of the ship. There is a tendency to overestimate the height of short waves, and underestimate the height of longer waves. Wave systems always contain waves of varying heights – report the significant wave height – the average height of the larger, better formed waves in your visual range.

The wave height code is in units of half meters. See the Ships code card or table 3.30 in *NWS Observing Handbook No. 1* for the wave height code table.

The vast majority of wave reports are made visually from aboard ship. Wave recording instruments are used on a small number of buoys, weatherships, lightships, and stationary vessels. There are three main uses for wave data. First, real-time wave data is needed to forecast future wave conditions. This is particularly important in connection with ship weather routing. Second, real-time wave data is also useful as a weather forecast guide – the onset of swell can serve as a clue to the approach or distant presence of a tropical storm. Third, large numbers of wave reports are required for the establishment of wave climatologies, which have many uses: planning the design of ships, orientation and construction of harbors and breakwaters, and control of coastal erosion and silting. Wave reports also provide valuable information during investigations of storm damage.

The reporting of wind is fully explained in *NWS Observing Handbook No. 1*, pages 3-12 through 3-35. Color sea state photographs depicting Beaufort Force 0-12 conditions are included on pages 3-17 through 3-29. A wall poster of sea state photographs for determining wind speed is available from your PMO.

The first five records show traces of sea waves, while the second set are swell waves. While there are clear cut differences, often actual wave conditions fall between these sets. The sea waves are quite high in some places and quite low in others. In the swell sets the waves are flatter and the length is usually longer. This graphic is from H.O. Pub. No. 603.

Swell as a Weather Forecast Guide

Since they usually originate in the heavy seas created in a storm area, the onset of swell waves can indicate the approach of a storm center or tropical weather system. If there is no land between the storm and the ship, a long swell will come from the direction of the storm center. The presence of swell can also be used to distinguish between a local squall and an approaching organized storm system. A threatening sky, with no swell present, is indicative of short-lived, bad

weather such as a thunderstorm or squall line. However, advancing and thickening storm clouds accompanied by increasing swell suggests an approaching storm with a large area of strong winds.

The appearance of swell can have other meanings. On the U. S. West Coast, a prominent westerly swell can indicate the approach of a broad region of strong westerly winds (which may last for one or more days), rather than a storm center. On the U. S. East Coast, an easterly swell is often left over by a storm which has already passed, a vestige of the storm's power. In any marine area, a swell with a period of more than about 6 seconds, may be produced by a gale or tropical storm at a great distance away, and represents little threat. Swell waves with the longest periods and wavelengths can travel very large distances and remain intact. The shorter swells have less energy and do not survive such long distances.

Marine Program Leader and San Francisco PMO on Training Cruises

Two marine observations program staff members are out helping cadets learn about meteorology and observing/coding procedures. Marine Program Leader Vince Zegowitz boarded the N.Y. State Maritime Academy training ship ***Empire State*** in Gibraltar, and will remain for the 2 week Atlantic crossing to New York. Robert Novak, PMO San Francisco, flew to Barcelona, Spain, to meet the T\S ***Texas Clipper***, the Texas A & M University training ship.

New VOS Program Brochure

A pamphlet describing the Voluntary Observing Ship (VOS) program is being prepared and should be available before early 1993. It will discuss the importance of observations and code, and the contents of VOS program ship observations. There will be a review of report transmission and observing procedures. It will also contain a discussion of the Port Meteorological Officer's role.

New Recruits – April–June, 1992

During the 3-month period ending June 30, Port Meteorological Officers recruited 54 vessels as weather observers/reporters in the National Weather Service (NWS) Voluntary Observing Ship (VOS) Program. The VOS program wants to thank the crews of these vessels for joining the program. The NWS VOS program now consists of 1626 vessels, 1554 operating on the high seas, and 72 on the Great Lakes.

VOS program vessels perform an indispensable service to the science of meteorology. Meteorological analyses depends very strongly on high quality surface data. This data is needed from all over the world, to locate, identify, and follow the movement of weather systems. Without the support of moving ships, there would be vast areas without data. This would make it nearly impossible to prepare weather forecasts for these areas, and would also create major problems for forecasting elsewhere. For example, forecasts in coastal areas are very dependent on data from ships because marine weather systems often move inland. We thank all ships' officers for their diligence and superb commitment in taking observations. The value of your observing efforts cannot be exaggerated to weather forecasters, the scientific community, maritime interests, and the general public.

Three Reminders

1. Please complete the transmission of your INMARSAT weather report in 30 seconds or less. This helps reduce communications costs paid by the NWS.

2. Always include section 0 of the synoptic code in your weather message. This is the first five groups of the weather message and consists of:

$$\text{BBXX D.....D YYGG}i_w\ 99L_aL_aL_a\ Q_cL_oL_oL_o$$

3. When reporting significant present or past weather (group $7wwW_1W_2$), code i_x in group i_Ri_xhVV as 1; when there is no significant weather to report, 1_x is coded as 2 and group $7wwW_1W_2$ is omitted from the weather message.

Please see the previous two Marine Observations Program columns for detailed discussions on these issues.

NATIONAL WEATHER SERVICE VOLUNTARY OBSERVING SHIP PROGRAM
NEW RECRUITS FROM 01-APR-92 TO 30-JUN-92

NAME OF SHIP	CALL	AGENT NAME	RECRUITING PMO
ADM. WM. M. CALLAGHAN	KGYE	T. P. HOST OF MD., INC	BALTIMORE, MD
AMERICAN GIRL	WJ7449	GILLESPI OIL & TANSIT	CHICAGO, IL
BANIA MAGDALENA	HPNG	BARBER WILHELMSEN AGENCIES CALIFORNIA INC	SAN FRANCISCO, CA
BRIDGETON	WCZB	GLENEAGLE SHIP MANAGEMENT CO., INC.	HOUSTON, TX
CALIFORNIAN	WST6145	THE NAUTICAL HERITAGE SOCIETY	SAN FRANCISCO, CA
CAVALLINO	3EMT7	TGM SHIPPING AGENCY	NEW ORLEANS, LA
CHESAPEAKE CITY	WCYS	GLENEAGLE SHIP MANAGEMENT CO., INC.	HOUSTON, TX
CHIQUITA MILANO	C6CE9	BANANA SUPPLY COMPANY	MIAMI, FL
COLUMBUS	C6JT9	V. SHIPS (USA) INC.	NEW ORLEANS, LA
COURTNEY L.	ZCAQ8	CAPES SHIPPING AGENCIES, INC.	BALTIMORE, MD
DAMODAR KAVERI	ATLC	DAMODAR BULK CARRIERS LTD, 215 SHAH NAHAR LT. IND.	HOUSTON, TX
DAMODAR KRISHNA	ATMQ	DAMODAR BULK CARRIERS LTD.	LOS ANGELES, CA
DANIEL FOSS	FOSS1	FOSS MARITIME CO.	SEATTLE, WA
ELLEN FOSS	FOSS2	FOSS MARITIME CO.	SEATTLE, WA
ELLEN KNUDSEN	LAKZ4	LAVINO SHIPPING AGENCY	NEWARK, NJ
FRED G.	WELN	PACIFIC-GULF MARINE, INC.	NEW ORLEANS, LA
GEORGE H. WEYERHAEUSER	C6FA7	CHEVRON SHIPPING CO.	SAN FRANCISCO, CA
HUAL INGRITA	LAUX2	AUTOLINERS, INC.	JACKSONVILLE, FL
J. DENNIS BONNEY	ELLE2	J. E. ASPEN SHIPPING CO.	BALTIMORE, MD
J.W. POWELL	WBA4695	TEXAS A&M MARINE OPERATIONS	HOUSTON, TX
JOHN J. BOLAND	WF2560	AMERICAN STEAMSHIP COMPANY	CLEVELAND, OH
JUSTINE FOSS	FOSS3	FOSS MARITIME CO.	SEATTLE, WA
LIBERTY BELLE	KCBM	LIBERTY MARITIME CORP.	SAN FRANCISCO, CA
LUCY OLDENDORFF	ELPA2	TOKAI SHIPPING CO. LTD.	LOS ANGELES, CA
MICHIGAN	WRB4141	COASTWISE TRADING COMPANY	CHICAGO, IL
NOSAC STAR	LAIZ4	NORWEGIAN SHIP MANAGEMENT A. S.	JACKSONVILLE, FL
OCEAN CITY	WCYR	GLENEAGLE SHIP MANAGEMENT CO., INC.	HOUSTON, TX
OVERSEAS VALDEZ	WOVS	MARITIME OVERSEAS CORP.	NORFOLK, VA
PATRICIA RICKMERS	DPPR	LYKES BROS. STEAMSHIP CO.	NEWARK, NJ
PRIDE OF BALTIMORE	WUW2120	PRIDE OF BALTIMORE, INC.	BALTIMORE, MD
PROOF GALLANT	D5Y0	LAVINO SHIPPING AGENCY	NEWARK, NJ
RAICHO 2	ELMH6	"K" LINE AMERICA INC.	SEATTLE, WA
RANGER III	WZ2056	NATIONAL PARK SERVICE	CHICAGO, IL
RISANGER	LANT4	WESTFAL-LARSEN & CO. A/S-SHIPOWNERS	SEATTLE, WA
RUBIN STEIN	DXPO	MITOYO SHIPPING CO, LTD, 7TH FLR CREATE GINZA BLDG	SEATTLE, WA
SANTA LUCIA	ELMX2	BILL BLACK AGENCY	NEWARK, NJ
SEA ISLE	WCYQ	GLENEAGLE SHIP MANAGEMENT CO., INC.	HOUSTON, TX
SEAL ISLAND	ELDM8	HESS OIL VIRGIN ISLAND CORP.	NORFOLK, VA
SIDNEY FOSS	FOSS4	FOSS MARITIME CO.	SEATTLE, WA
SINCERE SUCCESS	VRUC5	WILLIAMS, DIMOND & CO.	SEATTLE, WA
TARKWA	LAIW4		HOUSTON, TX
THEKWINI	C6HR8	BARWIL AGENCIES (TEXAS), INC.	HOUSTON, TX
TORM FREYA	OXDF3	KERR STEAMSHIP CO. INC.	NORFOLK, VA
USCGC BARANOF	NCUI	COMMANDING OFFICER, USCGC BARANOF	MIAMI, FL
USCGC BRISTOL BAY	NRLY	COMMANDING OFFICER	CLEVELAND, OH
USCGC DILIGENCE WMEC 616	NMUD	COMMANDING OFFICER-QM SECTION	NORFOLK, VA
USCGC MIDGETT (WHEC 726)	NHWR	COMMANDING OFFICER	SEATTLE, WA
USCGC RED WOOD	NDTE	COMMANDING OFFICER-QM SECTION	NORFOLK, VA
USCGC SASSAFRAS	NODT	USCGC SASSAFRAS	SAN FRANCISCO, CA
USNS BIGHORN	NBIG	USNS BIGHORN T-AO-198	NEW ORLEANS, LA
VIVA	LACU2	C.H. SORRENSEN & SONNER A/C	NORFOLK, VA
WENDY FOSS	FOSS5	FOSS MARITIME CO	SEATTLE, WA
WEST VIRGINIA	H9LS	BARWIL AGENCIES LOUISIANA INC.	NEW ORLEANS, LA
WESTERN INCA	P3OE4	HANSEATIC SHIPPING CO.LTD.	NEW ORLEANS, LA

Surfing the El Niño

Patrick Caldwell

The 1991/92 El Niño coincided with many global weather extremes. Droughts plagued Hawaii, Western Europe, South Africa, the Philippines, and the Pacific Northwest. Floods inundated Queensland, California, Ecuador, Mexico, and Texas. Record winter warmth blanketed the central USA, while extreme cold and snow chilled the Middle East. Just which of these events are due to the cyclical variations in weather patterns and which can be directly tied to the effects of the El Niño is a matter of intense study.

Gathering information on these episodes is tedious. One untapped source of coastal observations is those made by surfers. These are often made in areas that are lacking gages or recording stations and can be thought of as sort of a VOS (Volunteer Observing Surfer) program in coastal regions. Added to satellite, merchant marine, buoy and other observations, they can help paint a better picture of this infrequent visitor– the El Niño.

Because this event occurs near the Christmas season, coastal residents of Peru and Ecuador named it the El Niño, referring to the Christ Child. Roughly every 3 to 7 years, the large pool of warm oceanic water that lies in the tropical Western Pacific near Papua New Guinea moves eastward along the equator and replaces the normally cool waters of the Central and Eastern Equatorial Pacific. This massive area of warm surface water affects the atmosphere by creating deep towering convective storm clouds in a normally arid region. These clouds in return heat the upper atmosphere altering the paths of the Jet Streams, which are belts of extremely strong winds at high altitudes that drive the surface weather systems around the globe. Jet Streams are found both north and south of the equator between 30° and 60° North and South latitudes. Because the ocean's temperature changes slowly, the weather patterns tend to persist.

After the dramatic effects of the 1982/83 El Niño, which was the strongest identifiable weather event of the century causing billions of dollars in losses due to climatic catastrophes, scientists have focused attention on the cause, effect, and predictability of El Niño. Since 1988, the National Oceanic and Atmospheric Administration has prepared monthly bulletins of global ocean and weather conditions, with emphasis on the tropical Pacific and with the direct goal of predicting an El Niño. In fact, the 1991/92 El Niño was recognized as a possibility about a year in advance with accurate forecasts 6-months before the episode matured.

To see how surfer reports can assist in evaluating the effects of the El Niño, it is informative to look at similar El Niño surf patterns at a few selected sites. Since 1980, *The Surf Report* has published monthly summaries of surf conditions around the globe. These observations are made by surfers who prepare a tally and a description of significant wave and weather events at their local beaches. This is not as frivolous as it may seem. The National Oceanographic Data Center receives numerous requests for surf information

Patrick Caldwell works for the National Oceanographic Data Center and is assigned to the Tropical Ocean Global Atmosphere (TOGA) Sea Level Center at the University of Hawaii. He has an MS degree in meteorology from the Florida State University and has been fanatically surfing for over 18 years.

Bernie Baker

*The famous **Banzai Pipeline** on the North Shore of Oahu in Hawaii (above) benefits from the el Niño Boreal Winter weather pattern due to the greater occurrence of large swells from the ideal direction, west northwest. This allows the wave curl to maintain its form for a greater distance, thus providing the surfer a longer ride in the tube.*

each year and there are very few data available. Since 1980, three El Niño's have occurred: 1982/83, 1986/87, and 1991/92. However, the 1986/87 episode was mild compared to the extreme event of 1982/83 and the moderate-to-strong occurrence of 1991/92. Thus, in reviewing the monthly summaries from the *Surf Report*, only similarities in the 1982/83 and 1991/92 episodes could be easily identified with best agreement in the Pacific. The *Surf Report* is available from Surfer Publication, Inc., P. O. Box 1028, Dana Point, California 92629. In the *Surf Report* summaries MWH is mean wave height while LWH stands for largest wave height.

Western North Pacific

The pattern during an El Niño shows that the warmer than normal waters of the Central Pacific spawn more tropical cyclones from August through November north of the Equator. These storms tend to head northwestward past Guam toward Japan and then recurve northeastward into the northern North Pacific.

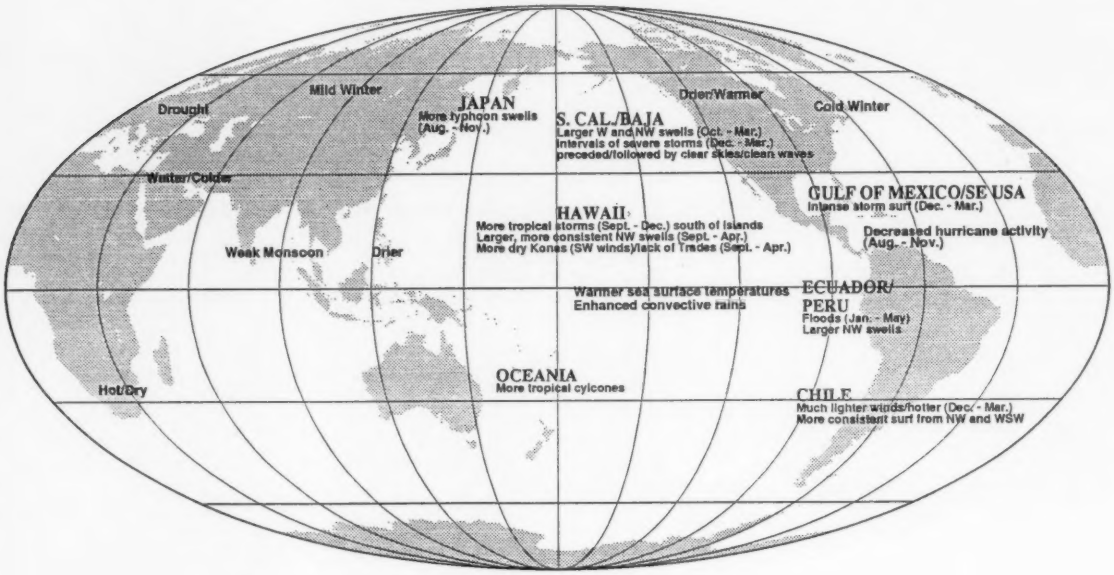
The Surf Report summary for September 1982:

Japan– Kamakura: Mean Wave Height (MWH): 4', Largest Wave Height (LWH): 10'. 3 typhoon swells [episodes] from south (S) lasting 4 days each, maxing at 8'. 2 direct hits on Shonan by typhoons. Warm and muggy with rain. NE offshore winds accompanied typhoon swells. . . Jeff Cooper.

The Surf Report summary for October 1991:

Japan– Shikoku: MWH: 4', LWH: 10'. Consistent typhoon swells since mid-August, each lasting 3–4 days. Most swells from S with a few southeast (SE). Reports of a few all-time classic days. Prevailing wind N and NE, sometimes causing cross-chop as typhoons near Japan. . . Chris Littlefield/Chris McHugh.

EL NIÑO SURF/CLIMATE PATTERNS



Hawaii

In an El Niño year the typhoons recurving off Japan start the Hawaiian fall/winter surf season off with a bang, along with enhanced tropical storm development near the islands, due to warmer than normal waters just south of Hawaii. As winter sets in, the Jet Stream becomes stronger coming from Japan then branching off toward Canada and Mexico just northeast of Hawaii. This steers numerous strong surface low pressure systems from Japan to the Gulf of Alaska, sending strong west northwest and northwest swells to Hawaii Meanwhile, the northeast Pacific surface high pressure system weakens and drifts south of Hawaii, causing persistent dry southwest and west winds. The Southern Hemisphere El Niño pattern of intensified Lows southeast of New Zealand initiates the south swell season by early March.

The Surf Report summary for February 1983:

Oahu: MWH: 15', LWH: 40'+. Nonstop W winds kept the N Shore blown out except for 2 days of NE trades. Best surf on E Side where winds were offshore. Biggest surf 2/11 (Feb. 11) as strong onshore winds washed out 3 homes at Off The Wall. Bathhouse gone at Makaha. Extremely dry. . . Bernie Baker.

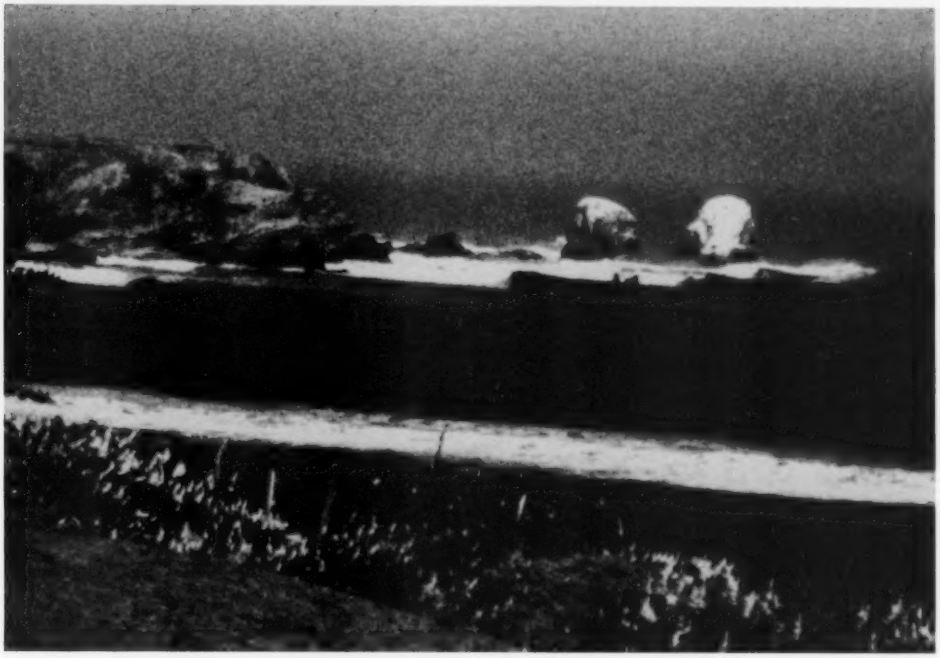
The Surf Report summary for February 1992:

Oahu: MWH: 8', LWH: 20'. Strong WNW, NW, and NNW swells to 20' but averaging 12' came in 1/7–2/5, then again 2/18–2/28, with N swell to 6' 2/9–2/14. 3–5' S swell hit town 2/18–2/21. Winds mostly light Konas (S to W) 1/4–1/31, strong N and NE 2/2–2/7, and back to moderate Konas 2/13–?/28. Surf best at N and NE facing shores due to Konas. Very dry except Kona rain 2/12–2/14. . . . Pat Caldwell

California

During the El Niño episodes, the strong North Pacific storms which affect Hawaii also send consistent large waves to the west coast of the USA. Local weather dictates surf conditions as the strong subtropical Jet Stream that races over Baja helps fuel Lows southwest of Los Angeles which track northeastward bringing torrential rains and big storm surf to Southern and Central California. Periods of clear skies with light or Santa Ana (east) winds precede and follow these storms that provide the best surf conditions.

Surf Report summary for February 1983:



Punto de Lobos, Central Chile, November 1991. The absence of strong southerly winds during the Austral Summer of an El Niño year is beneficial for surfers because the swells arrive in orderly, even lines with less wind chill.

Max Mills

Huntington Beach: MWH: 6', LWH: 10'+. Swells keep coming, some say best ever, at least since '69. Mostly N and W swells. Weekends of 12th and 19th good 6-10' N-NW swells, 21st perfect 6-8'. Outside sandbars the furthest out in years. Morning offshore during both swells. Latter part of month S winds and radical rains. 30-40' of pier swept away at end of Feb. . . . Peter Townsend.

The Surf Report summary for February 1992:

T-Street, San Clemente: MWH: 4', LWH: 8'. This month had it all. S Cal was beset by serious flooding in second week of Feb. Biggest waves during storms 2/5-15, peaking at 8' on 6th, but best days were during hot, dry Santa Ana (offshore) wind conditions during first and last weeks of the month. This year we've had our best winter of surf, perhaps ever. . . . Rus Calish.

Gulf of Mexico/ Southeast USA

El Niño Pattern: From December to March, the strong Jet Stream races over the Gulf of Mexico as deep Lows are spawned which track across the Gulf and into the Atlantic. These Lows send strong wind chop to the shores of Texas thru Florida with clean surf conditions just after the storm passage.

The Surf Report summary for February 1983:

Florida Gulf: MWH 4', LWH: 15'. Strong winter storm came out of Gulf, biggest surf since Hurricane Frederick tore down Pensacola Pier. A really good month for surf, lots of big swells and even a few good offshore days. . . . Yancy Spencer.

The Surf Report summary for February 1992:

Florida Gulf: Two swells this period, one 4 day and one 5 day starting SE and becoming SW from Low. Shell Island in Panama City had its best day since 1989 with 12-14' faces, offshore winds, and tubes. Feb usually best month for surf. March is good if lows keep forming in the Gulf. . . Yancy Spencer.

South America

In an El Niño year, during the Southern Hemisphere summer (December-March), the northwest facing shores of Ecuador, Peru and Chile receive an abundance of ground swells from the deep Lows in the North Pacific. The warm ocean waters initiate massive convective storms, which cause extensive coastal flooding in Ecuador and northern Peru. Off southern Peru and Chile, the normally strong semi- permanent

High weakens, allowing more glassy conditions (light winds) while the deep Lows in the *Roaring Forties*, between New Zealand and Chile, keep the southwest swells pounding.

The Surf Report summary for February 1983:

Salinas, Ecuador: MWH: 5', LWH: 9'. A large swell has hit all of Ecuador since Jan 20 and hasn't stopped since (2/21). Largest and best summer since 1978. Ancon Road was washed by the sea. . . Pina.

The Surf Report summary for February 1992:

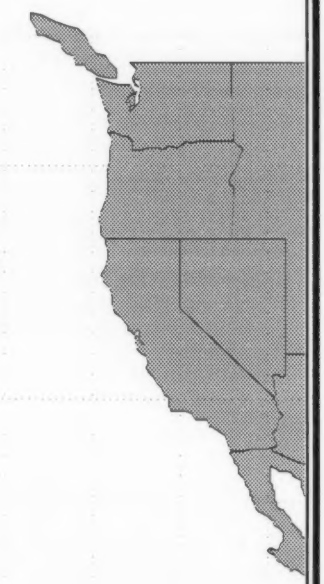
Central Chile: MWH: 5-8', LWH: 8-10'. We had one important five-day swell reaching 10' from NW. The rest of the period was one of the most consistent summers in recent years. The pattern of the period was the absence of S wind. Cloudy, glassy days made it like the tropical zone. . . . Carlos Lara.

These surf reports seem to show a correlation to strong El Niño events. They are one more indication of the wide-ranging effect the El Niño has on the meteorological and oceanographic patterns around the world. And while these reports lack the scientific validity of instruments and trained observers, they do carry the weight of enthusiasts whose careful awareness of their environment is crucial to their safety. In areas where scientific observations are lacking, these reports can help fill a void for researchers looking for the El Niño's effects.

El Niño Watch

NOAA's Coastal Ocean Program CoastWatch publishes an El Niño Watch Advisory for those interested in the El Niño. The advisory covers the area from northern Baja California to Vancouver Island, British Columbia and offshore to 135°W. The one page report presents a chart of monthly mean sea surface temperatures at selected locations and deviations from normal. It also includes a brief narrative on the anomalous conditions. The advisory began in January, 1992. There is no charge for the advisory. For further information write: Coastwatch

SW Regional Node
National Marine Fisheries Service
PO Box 271
La Jolla, CA 92038-0271
Tel: 619-546-7000



Maritime Cooperation

Jerry A. Williams
President, Oceanroutes, Inc.

Dear Dick:

We at OCEANROUTES have recently been involved in an investigation of missing ship weather reports. As a part of our ship routing business, we encourage our clients to transmit WMO observations as frequently as possible. This procedure provides additional weather reports and allows us to track client vessel positions without the ship having to send a separate message to us. It's a win-win situation for all parties.

If we fail to get a position report from a routed vessel, we send a message requesting the master to report his position. We recently noted several cases when the master indicated a weather report had been filed, but we had not seen it in the WMO collective. Our Mike Barbieri, working with NOAA/NWS people, found that the communications company who was sending messages from COMSAT to the NWS, was adding characters at the end of some of these telexes. Monitoring showed this to be occurring only in messages sent to the NOAA/NWS office in Washington, DC (answerback NWS OBS MHTS). A separate problem with observations sent via Hong Kong radio was also noted and is being investigated.

The problems have apparently been solved, as we have noticed a 14% increase in Pacific observations and a 7% increase in Atlantic observations since the trouble was identified.

I think this is an excellent example of public-private sector cooperation that resulted in better information for all users of Marine Weather Observations.

This is the kind of thing we love to hear about. It's like we just recruited 200 new ships for the program. Throughout the years we have always had a great working relationship with the people at Oceanroutes. Just last issue we used a summary of a New Year's Eve storm that they had prepared. –ed

Changes

Jim Nelson
PMO, Houston

PRETORIA, SOUTH AFRICA

CALL SIGNS	FREQUENCIES	TIMES	EMISSION	POWER
	4014 kHz	1530-0100	F3C	
ZRO2	7508 kHz	CONTINUOUS	F3C	8-30 KW
ZRO3	13538 kHz	CONTINUOUS	F3C	30 KW
ZRO4	18238 kHz	CONTINUOUS	F3C	30 KW

TRANS TIME	CONTENTS OF TRANSMISSION	RPMIIOC	VALID TIME	MAP AREA
0405	ECMWF SURFACE ANAL	120/576	0000	
0430	UPPER AIR ANAL	120/576	0000	
0445	SURFACE ANAL (SHIPPING)	120/576	0000	
0505	FAX SCHEDULE	120/576		
0520	SURFACE ANAL (1) (2)	120/576	0300	
0630	ECMWF UPPER AIR ANAL	120/576	0000	
0710	10-DAY MEAN SEA SURFACE TEMP(3) (4)	120/576		
0730	ECMWF SURFACE ANAL	120/576	0000	
0800	NORTHERN ICE LIMITS (ANTARCTICA)	120/576		
0920	ECMWF SURFACE	120/576	0000	
1000	SURFACE ANAL (SHIPPING)	120/576	0600	
1445	SURFACE ANAL (SHIPPING)	120/576	1200	
2200	SURFACE ANAL (SHIPPING)	120/576	1800	

NOTES: 1. SEAWARD ANALYSIS FOR PORTION OF AREA ONLY, DEPENDING UPON INFORMATION AVAILABLE.
2. BI-LEVEL CHART. ANALYSIS OVER CONTINENT FOR THE 850MB LEVEL.
3. ON MONDAY, WEDNESDAY AND FRIDAY. (EAST COAST)
4. ON TUESDAY, THURSDAY AND SATURDAY. (WEST COAST)
MAP AREAS: NOT AVAILABLE.
(INFORMATION DATED 04/1992)

MOBILE, ALABAMA, U.S.A.

CALL SIGN	FREQUENCIES	TIMES	EMISSION	POWER
WLO	6852 kHz	CONTINUOUS	F3C	
	9157.5 kHz	1200-2400	F3C	

TRANS TIME	CONTENTS OF TRANSMISSION	RPM/IOC	VALID TIME	MAP AREA
0230/1430	SURFACE ANAL (GULF OF MEXICO)	120/576	00/12	
---- /1445	BROADCAST SCHEDULE	120/576		
0735/1910	SURFACE ANAL (UNITED STATES)	120/576	00/12	
0920/2030	SURFACE ANAL (GULF OF MEXICO)	120/576	06/18	
----/2040	OCEANOGRAPHIC PRODUCTS(1)	120/576	LATEST	
1045/2245	HIGH SEAS FORECAST	120/576		
1120/2330	18/36HR SURFACE PROG (GULF OF MEXICO)	120/576	18/06	

NOTES: 1. GULF OF MEXICO AND ATLANTIC SEA SURFACE TEMP ANAL (MON/WED/FRI)
GULF OF MEXICO AND ATLANTIC GULF STREAM FLOW ANAL.
3. GULF STREAM FLOW PRODUCTS MAY NOT BE AVAILABLE DURING THE SUMMER MONTHS DUE TO WEAK ISOTHERMAL CONDITIONS IN THE GULF. ADDITIONAL INFORMATION ABOUT THESE PRODUCTS CAN BE OBTAINED BY CALLING (305) 665-6640.
4. THIS BROADCAST ORIGINATES FROM THE NATIONAL HURRICANE CENTER OF THE NATIONAL WEATHER SERVICE. COMMENTS AND SUGGESTIONS SHOULD BE DIRECTED TO: NATIONAL HURRICANE CENTER ATTN: CHIEF OF TSAF 1320 SOUTH DIXIE HIGHWAY, ROOM 631 CORAL GABLES, FL 33146
(INFORMATION DATED 05/1992)

NORFOLK, VIRGINIA, U.S.A.

CALL SIGN	FREQUENCIES	TIMES	EMISSION	POWER
NAM 3357	kHz	CONTINUOUS*		F3C
3731	kHz	(1)&		F3C
8000	kHz	U)NTINUOUS&		F3C
NAM 8080	kHz	(1)*		F3C
9318	kHz	CONTINUOUS$		F3C
NAM 10865	kHz	CONTINUOUS*		F3C
NAM 15959	kHz	0900-2100*		F3C
18245	kHz	(1) &		F3C
NAM 20015	kHz	00-2100*		F3C

* - NORFOLK FREQ &- THURSO FREQ $ - ICELAND FREQ

TRANS TIME	CONTENTS OF TRANSMISSION	RPM/IOC	VALID TIME	MAP AREA
0000/----	NFAX SCHEDULE	120/576		
----/1200	NMC BOUNDRY LAYERANAL	120/576	0000	
0015/1215	36HR 850MB HT/TEMPNVIND PROG	120/576	00/12	
0030/1230	36HR 500MB HT/TEMPN\IIND PROG	120/576	00/12	
0045/1245	48HR 500MB HT/TEMPN\AND PROG	120/576	12/00	
0100/1300	36HR SURFACE PRES PROG (S. ATL)	120/576	00/12	
0115/1315	48HR SURFACE PRES PROG (S. ATL)	120/576	12/00	
0130/1330	36HR 500MB HT PROG (S. ATL)	120/576	00/12	
0145/1345	48HR 500MB HT PROG (S. ATL)	120/576	12/00	
0200/1400	SATELLITE IMAGERY (GOES FULL DISK CH. 2)	120/576		
0215/----	NMC EXTENDED SURFACE U/A PROG	120/576	---/---	
----/1415	NMC 200MB ANAL	120/576	0000	
0230/1430	OPEN PERIOD			
0240/1440	RAFC 12HR SIGNIFICANT WEATHER PROG (FL250400)	120/576	12/00	
0250/1450	NMC 36HR 500MB HTASOTACH PROG	120/576	00/12	
0300/----	NOEC GULF STREAM ANAL	120/576	LATEST	
----/1500	FNOC SSTANAL	120/576	LATEST	
0315/1515	NEOC 36HR PROG BLEND	120/576	00/12	
0330/1530	NWS RADAR SUMMARY	120/576	LATEST	
0345/1545	OPEN PERIOD (TROPICAL WARNI NGS)	120/576		
0400/1600	500MB HT ANAL (S. ATL)	120/576	00/12	
0415/1615	FNOC PRELIM SURFACE ANAL (N. ATL)	120/576	00/12	
0430/1630	SURFACE TROP PRESN\IND ANAL	120/576	00/12	
0445/1645	SURFACE PRES ANAL (N. ATL)	120/576	00/12	
0500/1700	NMC 24HR NMG PROG	120/576	00/12	
0515/1715	SATELLITE IMAGERY (GOES GOMEX CH.14)	120/576	LATEST	
0530/1730	BRACKNELL 24HR SURFACE PROG	120/576	00/12	
0545/1745	SATELLITE IMAGERY (GOES N. ATL CH.15)	120/576	LATEST	
0600/1800	NMC 48HR NMG PROG	120/576	00/12	
0615/———	NWS RADAR SUMMARY	120/576	LATEST	
----/1815	NEOC SEA HEIGHT ANAL	120/576	1200	
0630/1830	850MB HTITEMP/WIND ANAL	120/576	00/12	
0645/1845	700MB HT/TEMPN\IINDANAL	120/576	00/12	
0700/1900	500MB HTITEMPN\/IND ANAL	120/576	00/12	
0715/1915	300MB HTITEMPN~INDANAL	120/576	00/12	
0730/1930	12HR SURFACE PRESN\IND PROG	120/576	12/00	
0745/1945	SATELLITE IMAGERY (GOES GOMEX CH. 14)	120/576	LATEST	
0800/2000	24HR SURFACE PRESN\IND PROG	120/576	00/12	
0815/2015	48HR SURFACE PRESN\/IND PROG	120/576	00/12	
0830/2030	NMC 24HR SIGNIFICANT WEATHER PROG	120/576	00/12	
0840/2040	NMC 36HR/48HR SIGNIFICANT WEATHER PROG	120/576	12/00	
0850/2050	OPEN PERIOD (TROPICAL WARNINGS)	120/576		
0900/2100	24HR SIGNIFICANT WAVE HEIGHT PROG	120/576	00/12	
0915/2115	SURFACE PRES ANAL (PRELIM)	120/576	06/18	
0930/2130	24HR 200MB HT/TEMPN~IIND PROG	120/576	00/12	
0945/----	BRACKNELL 48HR SIGNIFICANT WAVE PROG	120/576	0000	
----/2145	NEOC 84HR PROG BLEND	120/576	1200	
1000/2200	NEOC 12HR HIGH SEASN~IND WARNINGS	120/576	00/12	
1015/2215	24HR 850MB HT/TEMPN\AND PROG	120/576	00/12	
1030/2230	24HR 700MB HT/TEMPM/IND PROG	120/576	00/12	
1045/2245	24HR 500MB HT/TEMPN\/IND PROG	120/576	00/12	
1100/2300	24HR 400MB HT/TEMPM/IND PROG	120/576	00/12	
1115/2315	SATELLITE IMAGERY (GOES N. ATL CH.15)	120/576	LATEST	
1130/2330	24HR 300MB HT/TEMPN~/IND PROG	120/576	00/12	
1145/2345	24HR FREEZING LEVEL PROG	120/576	00/12	

ROTA, SPAIN

CALL SIGN	FREQUENCIES	TIMES EMISSION	POWER
AOK	4704 kHz (&)	1800-0600	F3C
	5785 kHz (&)	CONTINUOUS	F3C
	9050 kHz ($)	CONTINUOUS	F3C
	9382.5 kHz (&)	CONTINUOUS	F3C
	9875 kHz (&)	ON REQUEST	F3C
	17040 kHz ($)	CONTINUOUS	F3C
	17585 kHz (&)	0600-1800	F3C

(&) SPAIN FREQUENCIES ($)1TALY FREQUENCIES

TRANS TIME	CONTENTS OF TRANSMISSION	RPM/IOC	VALID MAP TIME AREA
0003/----	36HR GG THETA PROG	120/576	00/—
----/1203	72HR SURFACE PRESSURE/WIND PROG	120/576	00/—
0017/1217	24HR THICKNESS/SURFACE PROG	120/576	12/00
0031/----	MFAX SCHEDULE	120/576	—/—
----/1231	72HR 500MB PROG	120/576	00/—
0045/----	MFAX BROADCAST SCHEDULE (CONTD)	120/576	—/—
----/1245	ECMF 48HR SURFACE PRES PROG	120/576	—/12
0059/	OPEN		
----/1259	ECMF 48HR 500MB HT PROG	120/576	—/12
0113/1313	MIDEASTSURFACEPRESN\IINDANAL	120/576	12/00
0127/1327	MIDEAST 36HR SURFACE PRES/WIND PROG	120/576	00/12
0141/1341	MIDEAST 500MB HT/TEMPN\IIND ANAL	120/576	12/00
0155/1355	MIDEAST 36HR 500MB HT/TEMPN\/IND PROG	120/576	00/12
0209/1409	MIDEAST 36HR 250MB HT/TEMPN\IIND PROG	120/576	00/12
0223/----	WEST MED SST ANAL	120/576	00/—
----/1423	ECMF 96HR SURFACE PRES PROG	120/576	—/12
0237/----	EAST MED SST ANAL	120/576	—/12
----/1437	ECMF 96HR 500MB HT PROG	120/576	—/12
0251/1451	PRELIM SURFACE PRES ANAL (1)	120/576	00/12
0305/----	OPEN		
----/1505	ECMF 120HR SURFACE PRES PROG	120/576	—-/12
0321/----	SATELLITE IMAGERY	120/576	—/—
----/1521	ECMF 120HR 500MB HT PROG	120/576	—/12
----/1535	36HR SURFACE PRESN\IIND PROG (FSME1 LERT RETRANS)	120/576	1200
0349/1549	FSME LERT	120/576	00/12
0403/1603	SURFACE PRES ANAL	120/576	00/12
0417/1617	500MB ANAL	120/576	00/12
0431/1631	36HR SURFACE PRES PROG	120/576	12/00
0445/1645	36HR 500MB PROG	120/576	12/00
0459/1659	48HR SURFACE PRES PROG	120/576	00/12
0513/1713	SURFACE PRES ANAL (HAND DRAWN)	120/576	00/12
0527/1727	500MB HT/TEMPN\IIND ANAL	120/576	00/12
0541/1741	850MB HT/TEMPN\AND ANAL	120/576	00/12
0555/1755	SATELLITE IMAGERY	120/576	—/—
0609/1809	250MB HTASOTACHN\IINDANAL	120/576	00/12
0623/1823	400MB HT/TEMPN\IIND ANAL	120/576	00/12
0637/1837	925MB HT/TEMPN\/IND ANAL	120/576	00/12
0651/1851	700MB HT/TEMPN\/IND ANAL	120/576	00/12
0705/1905	24HR SURFACE PRESN\IIND PROG	120/576	00/12
0719/1919	24HR 500MB HT/TEMPN\/IND PROG	120/576	00/12
0733/1933	24HR 850MB HT/TEMPN~IIND PROG	120/576	00/12
0747/1947	24HR 250MB HT/ISOTACH/WIND PROG	120/576	00/12
0801/2001	24HR 400MB HT/TEMPN\IIND PROG	120/576	00/12
0815/2015	24HR 925MB HT/TEMPN\IIND PROG	120/576	00/12
0829/2029	24HR 700MB HT/TEMPM/IND PROG	120/576	00/12
0843/2043	500MB SD/SR LONGWAVE/POSVORTANAL	120/576	00/12
0857/2057	36HR SURFACE PRESN\IINDANAL	120/576	12/00
0911/2111	36HR 850MB HT/TEMPM/IND PROG	120/576	12/00
0925/2125	36HR 500MB HT/TEMPM/IND PROG	120/576	12/00
0939/2139	36HR 700MB HT/TEMPN~IIND PROG	120/576	12/00
0953/2153	36HR 250MB HT/ISOTACHN~IND PROG	120/576	12/00
1007/2207	SURFACE PRES PRELIM ANAL (1)	120/576	06/18
1021/2221	36HR SURFACE PRESN\IIND PROG (FSME1 LERT)	120/576	12/00
1035/2235	FSME LERT (CONT)	120/576	
1049/2249	36HR SIGNIFICANTWAVE PROG (OSME LERT)	120/576	12/00
1103/----	36HR N. ATLANTIC SURFACE PROG	120/576	1200
----/2305	GG THETA ANAL	120/576	—/12
1119/2319	36HR 500MB SD/SR LONGWAVEAPOSVORT PROG	120/576	00/12
1135/2335	48HR SURFACE PRESN\IIND PROG	120/576	00/12
1149/2349	48HR 500MB HT/TEMPM/IND PROG	120/576	00/12

NOTES: 1. ISOBAR SEPARATION 4MB IN WINTER, 2MB IN SUMMER.
2. CHANGES IN THIS BROADCAST ARE DICTATED BY THE NEEDS OF THE UNITED STATES NAW.
(INFORMATION DATED 04/1992)

BUENOS AIRES, ARGENTINA

CALL SIGNS	FREQUENCIES	TIMES	EMISSION	POWER
LRO69	5185 kHz	CONTINUOUS	F3C	5 KW
LRB72	10720 kHz	CONTINUOUS	F3C	5 KW
LRO84	18093 kHz	CONTINUOUS	F3C	5 KW

TRANS TIME	CONTENTS OF TRANSMISSION	RPM/IOC	VALID TIME	MAP AREA
----/1400	NEPHANAL (FROM SATELLITE PHOTOS)	1201576	1200	A
-----/1420	SURFACE ANAL	120/576	0900	A
-----/1430	TEST CHART OR FACSIMILE SCHEDULE	120/576		
0400/-----	SURFACE ANAL	120/576	0000	A
-----/1630	1000MB ANAL WITH 1000/500MB THICKNESS	120/576	1200	A
-----/1640	500MB ANAL WITH ISOTACHS	120/576	1200	A
-----/1650	TROPOPAUSE/MAX WIND ANAL	120/576	1200	A
-----/1700	EQUIVALENTPOTENTIALTEMP/PRECIPITABLEWATERANAL	120/576	1200	A
-----/1710	850MBANALWITH ISOTACHS	120/576	1200	A
-----/1720	700MB ANAL WITH ISOTACHS	120/576	1200	A
-----/1730	300MB ANAL WITH ISOTACHS	120/576	1200	A
-----/1740	200MB ANAL WITH ISOTACHS	120/576	1200	A
-----/1810	24HR 1000MB PROG WITH 1000/500MB THICKNESS	120/576	1200	A
-----/1820	24HR 500MB PROG WITH ISOTACHS	120/576	1200	A
-----/1830	600MB VERTICAL MOTION ANAL	120/576	1200	A
-----/1840	24HR 600MB VERTICAL MOTION PROG	120/576	1200	A
-----/1850	NEPHANAL (FROM SATELLITE PHOTOS)	120/576	15/18	A
-----/1910	24HR AMOUNT OF PRECIPITATION	120/576	1200	A
-----/1920	24HR 850MB ISOTACH PROG	120/576	1200	A
-----/1930	24HR 700MB ISOTACH PROG	120/576	1200	A
-----/1940	24HR 300MB ISOTACH PROG	120/576	1200	A
-----/1950	24HR 200MB ISOTACH PROG	120/576	1200	A
0800/-----	1000/500MB ANAL WITH PRECIPITABLE WATER	120/576	0000	A
-----/2000	CIRCUMPOLAR SURFACE ANAL	120/576	1200	A
0810/-----	500MBANALWITHISOTACHS	120/576	0000	A
0820/-----	850MB ANAL WITH ISOTACHS	120/576	0000	A
-----/2020	700/375MB SIGNIFICANT WEATHER PROG (MID LEVEL)	120/576	1200	A
0830/-----	700MB ANAL WITH ISOTACHS	120/576	0000	A
0840/-----	300MB ANAL WITH ISOTACHS	120/576	0000	A
-----/2040	375/145MB SIGNIFICANT WEATHER PROG (HIGH LEVEL)	120/576	1200	A
0850/-----	200MB ANAL WITH ISOTACHS	120/576	0000	A
0900/-----	1000MB ANAL WITH 1000/500MB THICKNESS	120/576	0000	A
-----/2100	SEA STATE ANAL	120/576	1200	A
0910/-----	24HR 500MB ISOTACH PROG	120/576	0000	A
0920/-----	24HR 850MB ISOTACH PROG	120/576	0000	A
-----/2120	24HR UPPER AIR PROG (BY NMC WASHINGTON D.C.)	120/576	1200	G
0930/-----	24HR 700MB ISOTACH PROG	120/576	0000	A
-----/2130	48HR UPPER AIR PROG (BY NMC WASHINGTON D.C.)	120/576	1200	G
0940/-----	24HR 300MB ISOTACH PROG	120/576	0000	A
-----/2140	48HR UPPER AIR PROG (BY NMC WASHINGTON D.C.)	120/576	1200	G
0950/-----	24HR 200MB ISOTACH PROG	120/576	0000	A
1000/-----	600MB VERTICAL MOTION ANAL	120/576	0000	A
-----/2200	NEPHANAL (FROM SATELLITE PHOTOS)	120/576	18/21	A
1010/-----	24HR 600MB VERTICAL MOTION PROG	120/576	0000	A
1020/-----	24HR AMOUNT OF PRECIPITATION	120/576	0000	A
1030/-----	NEPHANAL (FROM SATELLITE PHOTOS)	120/576	00-09	A
1050/-----	SURFACE ANAL	120/576	0600	A

MAPAREA: A - 1:20,000,000 07S 095W, 05S 035W,39S 014E, 40S 144W
G- 1:40,000,000 EQ 125W, EQ 055W.30S 000, 30S 180

(INFORMATION DATED 01/1992)

North Atlantic Weather January, February, and March 1992

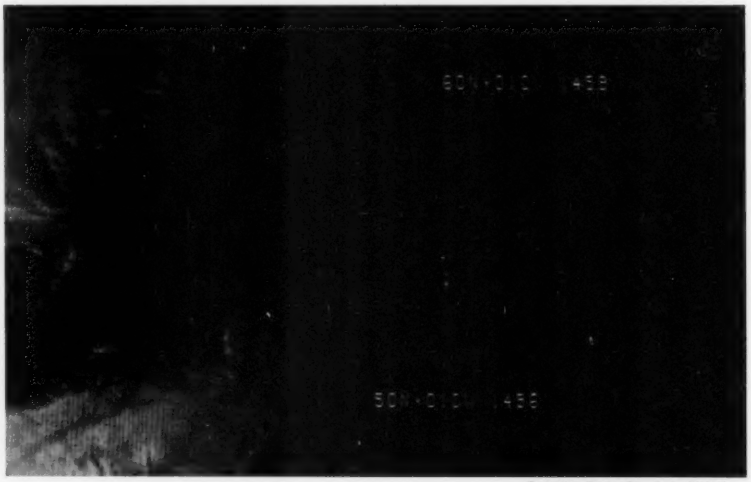
January– The most noticeable feature on the mean pressure chart in the Atlantic was a large 1028–mb high over western Europe which resulted in positive anomalies of up to 18 mb over Great Britain. This shifting and intensification of the usually weak Azores–Bermuda High left an area of negative anomalies down to 8 mb in the open ocean.

The big weather story was the New Year's eve hangover from the Hogmanay Storm (see Mariners Weather Log, Spring 1992, pg 71). The storm continued to make the North Sea a banging pot into the new year. In the most affected area east of Shetland, the Brent Doil installation recorded a gust of 107 mph. The lighthouse Muckle Flugga reported 150–kn gusts and at one stage the lighthouse anemometer registered 125 kn for one–half hour. Rigs and vessels on the 1st reported winds in the 60– to 70–kn range with seas up to 40 ft.

January spawned a few storms of its own as well, particularly during the second half of the month. However, in the wake of the previous system a 966–mb Low roared across Iceland on the 2nd. This reinforced the complex situation in the Norwegian Sea and for several days the eastern North Atlantic, North Sea, and Norwegian Sea took a pounding. Gale and storm force winds continued into the 3rd in the North Sea, particularly off Scotland. The 4th brought strong wind, and although the weather quieted somewhat by the 6th, there were still scattered reports of gales.

On the 10th a Low moving off the east coast of Greenland intensified suddenly, and in combination with another center farther east, it generated gales across the northern shipping lanes. At 1200 on the 10th, Rig no. 62137 (61°N, 1°E) measured 50–kn winds and 33–ft seas. These conditions continued in this region into the 11th.

On the 19th a system which had formed the previous day flared up south of Greenland. By 0000 on the 20th, near 60°N, 43°W, its central pressure was down to 944 mb. There were very few ship reports in the immediate vicinity of the storm, but the



Satellite Data Services Division

The satellite photograph was taken on the 22nd at about 1500 UTC. The storm's center had just crossed the 50th parallel near 30°W and the storm was intensifying rapidly.

Jokulfell (62°N, 29°W) sent in several reports of southeast winds in the 50-kn range from late on the 19th through the 20th. As the original storm took off through the Labrador Sea and into Baffin Bay, a 952-mb center developed along its trailing cold front and moved through the Denmark Strait on the 21st. This resulted in a flurry of storm force wind reports from the Greenland Sea to the North Sea. At 0600 on the 21st, the PERT (54°N, 6°E) encountered a 63-kn easterly. The next day drilling Rig no. 62117 (58°N, 0°) measured a 59-kn northerly at 0300.

By this time a 960-mb Low was heading northward across the 50th parallel toward Iceland. It had developed on the 18th in the Gulf of Mexico just south of Houston. After moving east northeastward and developing slowly for several days, its pressure dipped from 988 mb at 1200 on the 21st to 960 mb 24 hrs later. It continued to deepen and by the 23rd at 0000 plummeted to 948 mb. The LASA 3 (54°N, 28°W) had been close to the center at 1800 on the 22nd and reported 68-kn south southwesterlies and a 967-mb pressure in 36-ft seas. At 0300 on the 23rd, the DFLM measured a 66-kn southerly near . The DFLM (59°N, 7°W) continued to come in with storm force winds for the next several hours. The system accelerated northeastwards and weakened on the 24th.

Casualties– In the midst of the Hogmanay Storm rigs and standby supply vessels took a beating. Dozens of rigs lost anchor cables and lifeboats, while the vessels were battered by the wind. In the most serious incident a Coastguard helicopter from Aberdeen was sent to rescue the 11-member crew of the supply vessel ***Veesea Sapphire***. A huge wave had smashed the boat's bridge leaving it without power. Conditions were so bad that the helicopter was unable to lift anyone to safety. Fortunately, the ship's crew managed to restore power. Along the western coast of Norway, hurricane force winds and huge waves drove several vessels aground and caused the stern trawler ***Moretral*** to sink near Aalesund. Winds and waves also smashed open fish farms allowing some 700 tons of salmon to escape. The ***Seaboard Sentry*** (57°N, 1°E) had its wheelhouse damaged by heavy seas and one crew member was seriously injured.

During heavy weather in the western Atlantic around the 4th, the ***Santa Clara I*** lost 21 containers overboard. Because of the severity of the weather, the damage was not noticed until the vessel reached Cape Henlopen at the entrance to Delaware Bay. Some of the missing drums contained poisonous chemicals. The ro ro vessel ***Tapiola*** and the container vessel ***Limari*** also reported heavy weather damage during this period. On the 7th five fishermen, who spent more than 2 days in a life raft, were brought ashore safely after being rescued some 170 mi east of New Jersey. They had drifted there in freezing weather after their vessel ***Lois Joyce*** sank suddenly about 90 mi south of Block Island, RI on the 4th as 60-kn winds blasted the New Jersey and Maryland coastal waters. They were rescued by the USCGC ***Alert*** after their life raft was spotted by a Coast Guard aircraft.

February– A large, out-of-season Azores High dominated the eastern North Atlantic this month. This combined with a stronger than normal Icelandic Low created a very steep pressure gradient from the Grand Banks to the Norwegian Sea.

Several storms made crossing along the northern shipping lanes difficult for mariners plying the waters of the Denmark Strait as well as for those south of the strait. On the 7th a 956-mb Low was spotted near 53°N, 40°W, while another 956-mb Low came through 4 days later, just 180 mi to the north. At 0600 on the 7th, the ***Atlantic Compass*** (47°N, 47°W) ran into 60-kn winds and 30-ft seas. This might have been the roughest day of the month as a 957-mb Low was analyzed near 70°N, 5°W. The two systems together qualify as **Monster of the Month–** and a two-headed one at that. They terrorized ships and rigs from late on the 6th through the 9th. At 1800 on the 7th, the GLFX 3 (45°N, 41°W) measured 60-kn westerlies in 16-ft seas and 33-ft swells, while the LFAW (66°N, 8°E) hit 58-kn westerlies in 23-ft seas.

By the 11th the systems were replaced by another potent 956-mb Low, which had formed off northern Florida on the 6th. Winds in the 40- to 50-kn range were common as were seas up to 20 ft. An intense 960-mb Low moved across Iceland on the 23rd, while a 954-mb Low turned a counter clockwise loop in the Denmark Strait on the 24th and 25th. By the 27th another double header had developed, with 960-mb cen-

ters near 51°N, 48°W and 63°N, 12°W. At 0000 on the 28th, the northern Low's pressure dipped to 948 mb. The ***Cumulus*** (British OSV C, 55°N, 13°W) on the 28th experienced 52-kn southerlies in 13-ft swells, which was typical of conditions in these waters. The southern storm intensified even more as it moved close to the Denmark Strait. On the 28th its pressure dropped to 954 mb and it continued to create rough weather as the month came to an end.

Casualties– The bulk carrier ***Alexander's Ability*** from New Orleans for Cyprus, grounded in heavy weather at a Freeport, Bahamas anchorage on the 6th. On the 22nd the mv ***Superiority*** (57°N, 1°W) ran into trouble when its deck cargo shifted in gales. The crew were forced to cut the lashings and jettison part of the cargo. The stern trawler ***Krossnes*** sank suddenly off Iceland's northwest coast on the 22nd. Rescuers found eight crew members alive in two rubber dinghies, with three others missing.

March– A large Azores High, which resulted in positive anomalies of up to 6 mb over the Azores, was the dominant feature in the North Atlantic. Negative anomalies were analyzed over the Barent and Labrador Seas, where the Icelandic Low was relegated. However, this situation did generate a tight pressure gradient along the northern shipping lanes. The storm tracks reflect this gradient and ran, in general, from northeastern North America northeastward to Iceland.

The most intense storm of the month created havoc over the North and Norwegian Seas on the 12th. As a 982-mb system, it moved across southern Iceland on the 11th before it exploded. By 0000 on the 12th, its central pressure was down to 963 mb and 12 hours later it plunged to 944 mb. Winds in the 40- to 50-kn range were reported late on the 11th in the North Sea and they increased significantly by early on the 12th. Near 61°N, 1°E at 0000 on the 12th the GCLC measured 60-kn southerlies in 13-ft seas, while the nearby Rig 63108 measured a 54-kn wind and reported 26-ft swells with a 967-mb pressure. Rig 63103 (61°N, 2°E) recorded a 960-mb pressure at 0300 while observing 20-ft seas. Winds in the 40-to 60-kn range were common throughout the day. At 0600 Rig 63108 reported 55-kn westerlies, a 967-mb pressure, and 25-ft seas. These conditions persisted into the 13th as the storm moved ashore. For example, the GUMF (61°N, 1°W) measured a 58-kn west northwesterly at 0300, while the ***Stortebeker*** (57°N, 11°E) came in with a 54-kn westerly at 1200. Conditions did improve by 1200 on the 14th as the storm's center made its way across the Gulf of Bothnia.

On the 15th an intensifying 960-mb storm made its way across the 55th parallel near 40°W and headed toward southern Iceland. Winds were being reported in the 40- to 50-kn range with 15- to 20-ft seas. Typical of the reports being received was that of the ***Frithjof*** (64°N, 36°W) at 1200 who measured 45-kn northeasterlies while battling 23-ft swells. After crossing Iceland the storm turned northeastward, accelerated and weakened.

A weak Low came off the South Carolina coast on the 20th and headed east northeastward. The following day it began to organize and curve northward. On the 22nd it approached Newfoundland sporting a 962-mb center and terrorized vessels from the Grand Banks to the Gulf of Maine. The ***Henry Larsen*** (48°N, 60°W) was blasted by a 58-kn northerly in a snow squall that reduced visibility to 50 yds. The ***Edward Cornwallis*** nearby reported 54-kn winds and similar weather. Air temperatures were below freezing and miserable conditions continued into the 23rd as the weakening system moved across Newfoundland and into the Labrador Sea. There was a noticeable improvement late on the 23rd.

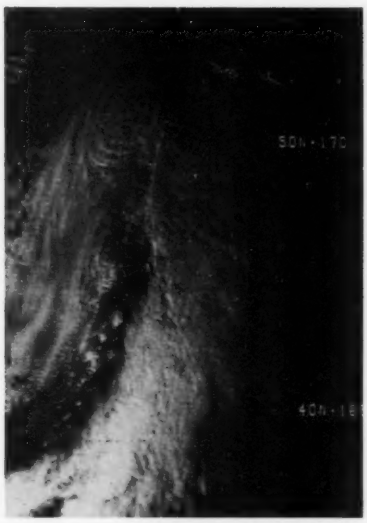
Casualties– the bulk carrier ***Gulfwind*** bound for New Orleans struck a Texaco oil platform on the night of the 5th. Luckily , there were no injuries and an oil spill was averted when the crew on the platform noticed the ship nearing the rig and shut down operations. The ***Spes Melior V*** (60°N, 1°E) broke down and required a tow in severe weather on the 11th. In the same area the ***Val-halla IV*** ran aground in force 9 winds and heavy seas. The vessel was eventually towed to safety. The ro ro mv ***Havelot*** enroute from Ireland to France put back into Cork on the 22nd when three people were injured as a freak wave hit the vessel. The wave caused a 30° roll to port and several vehicles were also damaged. The ***Eri S*** from Morocco to Ireland sank off the north coast of Spain after taking on water in heavy seas on the 24th. All 10 crew members were rescued.

All times unless noted are UTC (universal time) and all miles are nautical. For additional detail, tropical cyclones will be covered in the annual reports from the tropical cyclone centers around the world. The weather summaries, based upon track charts, Northern Hemisphere Surface Charts, and ship reports, will highlight the most significant ocean weather features each month. The track charts are provided by NOAA's National Meteorological Center. If an extratropical storm is particularly bad for shipping, it is baptized the Monster of the Month. The Gale Tables provided by the National Climatic Data Center at Asheville, NC, have been dropped because of space limitations. However, we will provide them to anyone who writes in.

—ed.

North Pacific Weather January, February, and March 1992

January– A deep Aleutian Low centered south of the Alaskan Peninsula spread its influence from Japan to Vancouver Island and resulted in negative anomalies of 1 to 8 mb. This climatic situation spelled big trouble for North Pacific mariners since the climatic low was the result of several storms with central pressures in the 950- to 960-mb range. On the 4th a 984-mb Low was heading north northwestward toward the Fox Islands in the Aleutian Chain when the bottom dropped out. By 1200 on the 4th, its central pressure was down to 956 mb and 24 hrs later it dipped to 953 mb. At 0600 on the 4th, the ***Sea-Land Spirit*** (44°N, 172°W) hit 58-kn southerlies in 25-ft seas.



Satellite Data Services Division

Early on the 4th, this storm already looks bad and it had yet to explode.

A 966-mb storm crossed the International Dateline on the 15th on its way to the Alaskan Peninsula. Before reaching its destination, its central pressure dropped to 948 mb on the 16th as it approached the 50th parallel. Ships were reporting 40- to 50-kn winds. The ***Daio Andes*** (42°N, 169°W) reported a 967-mb pressure and measured 48-kn winds in 17-ft swells at 0000 on the 10th.

Some real action took place from the 22nd to the end of the month. A storm off Hokkaido barreled along the 45th parallel and by the 20th its central pressure was down to 968 mb and falling. Another system sprang up the following day near 37°N, 153°W. That was followed by the development of two more storms on the 23rd, both forming east of the dateline. All of these Lows developed centers whose pressures dropped below 965 mb. On the 25th and 26th, two 965-mb storms dominated weather over the entire eastern North Pacific. During the last 5 days of the month, two storms with central pressures below 970 mb moved through the Gulf of Alaska. Gale reports flowed in and were supplemented by reports of 20-ft seas.

Casualties– Typhoon Axel struck the Marshall Islands on the 6th. It was said to be the worst storm to hit these atolls since 1918. On the 8th huge waves lashed Majuro submerging houses knee-deep in water. Winds of up to 88 kn were reported as the typhoon moved through.

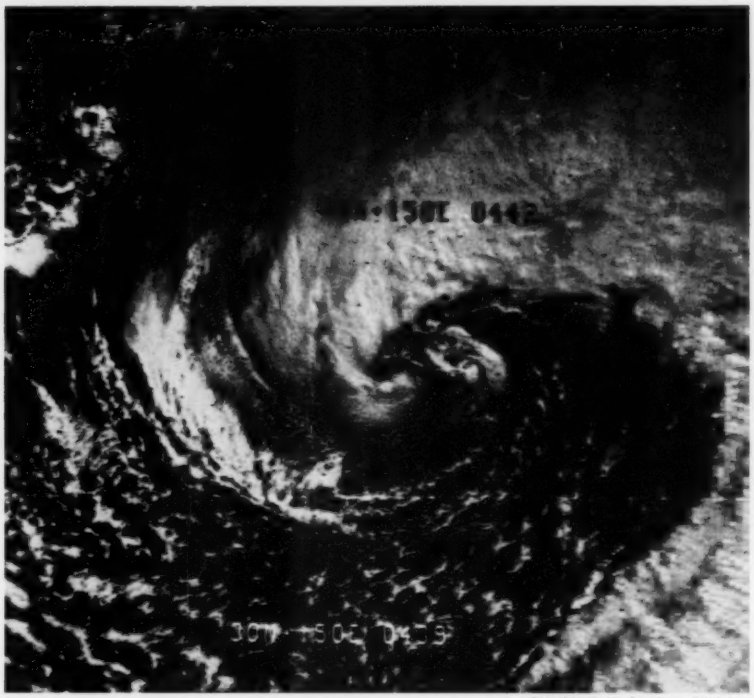
February– Two large 1002-mb low pressure centers, one in the Gulf of Alaska and the other off the Kamchatka Peninsula, dominated the climatic chart for February. This resulted in negative pressure anomalies in the eastern North Pacific and positive ones over the Aleutains, where the Low is normally situated. This climatic pattern reflected abundant

cyclonic activity in the Gulf of Alaska and around Kamchatka and a lack of storms south of the Aleutians. For the most, part the storms lacked the tenacity that was apparent in the Atlantic February storms. In general the storm tracks stretched from Honshu along the 40th parallel to about 150°W where they turned northward toward the Gulf of Alaska.

The first half of the month was dominated by several large Highs over the central Pacific, which tended to keep storm activity confined to the eastern and western portions of the basin. On the 10th a northward moving Low flared up briefly as it crossed the western Aleutians. Its central pressure dipped to 956 mb. This was duly noted by the ***Donaire*** (52°N, 175°E) which reported 44-kn winds while battling 21-ft swells. At 0000 on the 11th, the ***Ever Globe*** (56°N, 174°E) encountered a 52-kn southerly while battling 30-ft seas. However, the storm soon entered the northern Bering Sea late on the 11th.

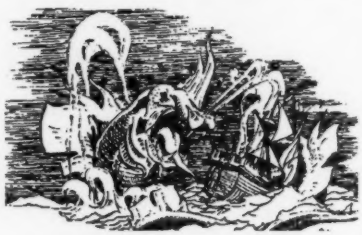
Storm activity in the Gulf of Alaska and northeastern North Pacific was concentrated into the last 10 days of the month as several 970-mb and 980-mb storms wreaked havoc. Each day a few vessels reported gale or storm force winds. For example, the ***Discoverer*** (46°N, 128°W) ran into 40-kn winds on the 21st while the ***River Ace*** (52°N, 139°W) measured 46-kn westerlies in 17-ft swells on the 22nd. The following day the ***Keystone Canyon*** reported 52-kn southerlies near 54°N, 137°W and this pattern of scattered gale reports continued until near the end of the month.

Monster of the Month— A vicious storm developed along a stationary front just south of Tokyo on the 24th. It intensified rapidly from a 990-mb Low early on the 24th to a potent 948-mb system by 1200 on the 25th. It did not go unnoticed by mariners as it crossed the 40th parallel and its circulation covered a good portion of the western North Pacific. An excellent report was received from the YJZH9 (43°N, 175°E) on the 26th at 0600. The vessel measured 55-kn east southeasterlies in 23-ft swells with a 982-mb pressure. At the same time, the ***Green Bay*** near 39°N, 168°E measured 45-kn winds while battling 40-ft swells and 26-ft seas. The storm remained intense into the 28th. During that period it slowed, turned a counterclockwise loop between 40° and 45°N around 165°E and compounded the problems for ships by remaining in one area for a period of time. While the northerly routes took a beating, the ones to the south were also feeling the effects of this monster. One ship, the J8FC9 (28°N, 166°E) was battered for hours by 55-kn winds in 19-ft seas. Finally, the storm began to weaken as the month came to a close.



Satellite Data Services Division

A look at the Monster of the Month on the 25th at about 0500, as it was beginning to intensify east of Honshu. The central pressure dropped to about 948 mb some 7 hrs later and gale force winds were common in these waters for several days.



Casualties— The ro ro ferry ***Natra-Seas I*** encountered heavy weather on the 21st and ran aground while on a voyage from Mebaru, Hiroshima to Padang Bay, Bali.

Satellite Data Services Division

While one storm was weakening, another was developing in this shot taken on the 8th just after 0200. The very prominent cold front is attached to the developing storm, which would soon terrorize the northern shipping lanes with gale force winds.

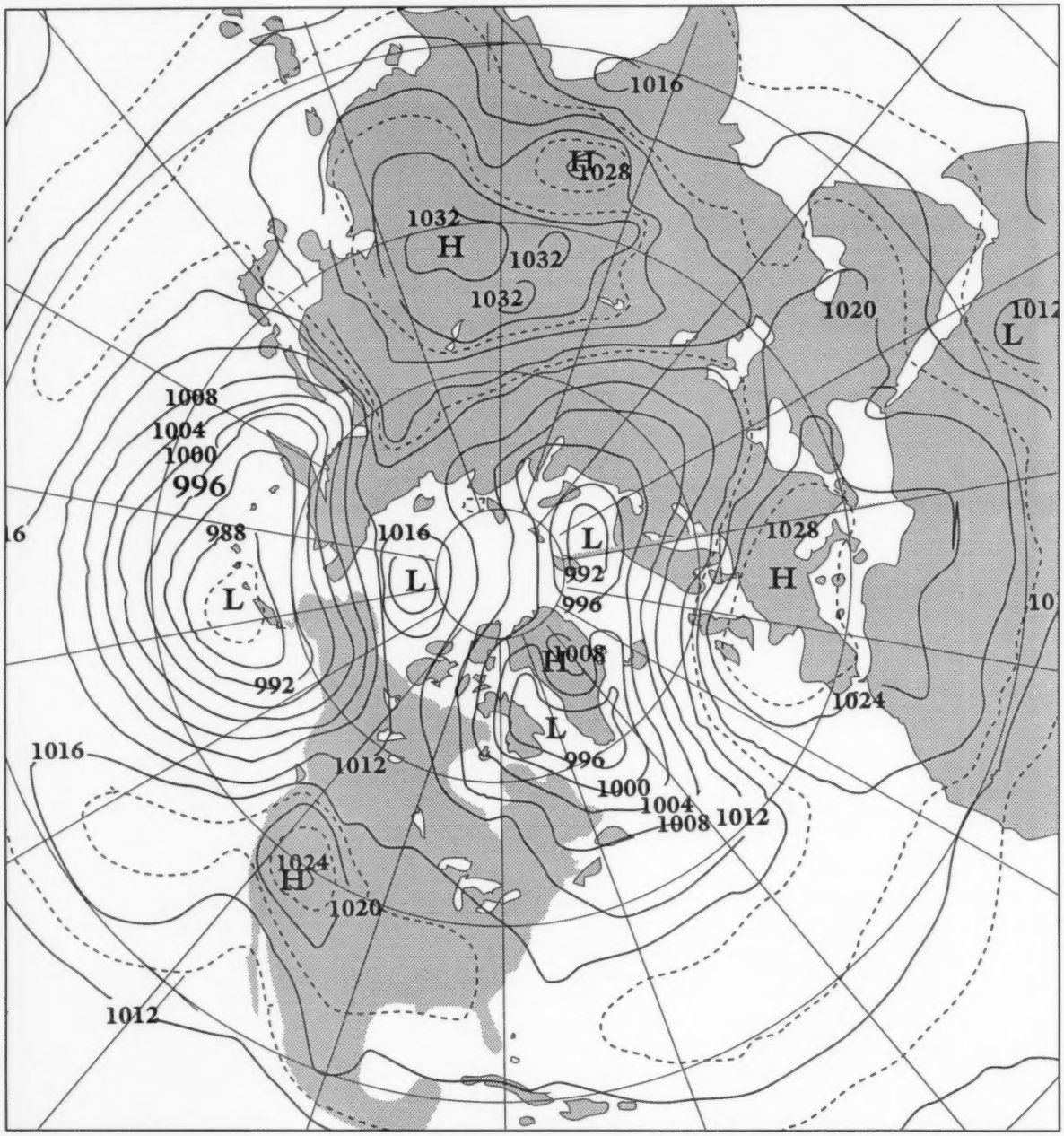
March– On this month's climatic chart, an unusally intense Aleutian Low was positioned in textbook fashion over the Aleutians and was flanked by a broad expanse of subtropical high pressure to the south. The Low produced anomalies of –4 mb because of its intensity, but it left a hole in the Gulf of Alaska which was filled by a high pressure area from the continent of North America. The storm tracks reflected these climatic features as they were concentrated over the Aleutians and sparse over the Gulf of Alaska.

On the 5th a 952–mb center was spotted near 45°N, 175°W. This was a dramatic decrease of some 42 mb in 24 hrs The ***Mizukawa Maru*** (41°N, 175°E) at 0300 on the 5th measured a 53–kn wind while battling 17–ft swells, while the Hawaiian Rainbow (44°N, 179°W) measured 53–kn winds in 30–ft seas. As often happens in the Pacific when conditions deteriorate this rapidly, there was little advance warning. Winds in the 40– to 50–kn range were common through the 6th as the system began to slow and turn a counterclockwise loop. While it weakened on the 7th, near 50°N, 175°W, another Low was taking over about 300 mi to the south. On the 8th its central pressure was estimated at 964 mb and there was little improvement in the weather and winds over the shipping lanes to the north. Through the 7th and into the 8th, the WPGK (36°N, 164°E) at 1800 on the 7th reported 45– to 52–kn winds with seas up to 16-ft and swells to 25-ft. It wasn't until the 10th that conditions began to ease in these waters.

Several very intense storms arrived shortly after the 20th. A storm that had formed off Hiroshima on the 18th and moved east northeastward, deepened rapidly on the 20th. By the following day it had a 966–mb center near 50°N, 175°W. In its wake came a 957–mb storm on the 23d. The ***Westwood Cleo*** (37°N, 151°E) at 1800 on the 21st experienced 49–kn westerlies, and this was confirmed a short time later by the ***Sakaide Maru*** when they ran into 60–kn winds in 20–ft swells. At 0600 on the 22nd, the ***Shirasagi Maru*** (42°N, 166°E) was belted by 52–kn west southwesterlies in 21–ft swells. Storm force winds were common on the 23rd and the ***Sea–Land Pacific*** (45°N, 177°W) encountered 33–ft swells at 1200. This was topped by the same vessel on the 24th when swells were estimated at 41 ft near 46°N, 171°W. Several other vessels were also being pounded by wind and swell. An easing of conditions finally came on the 24th.

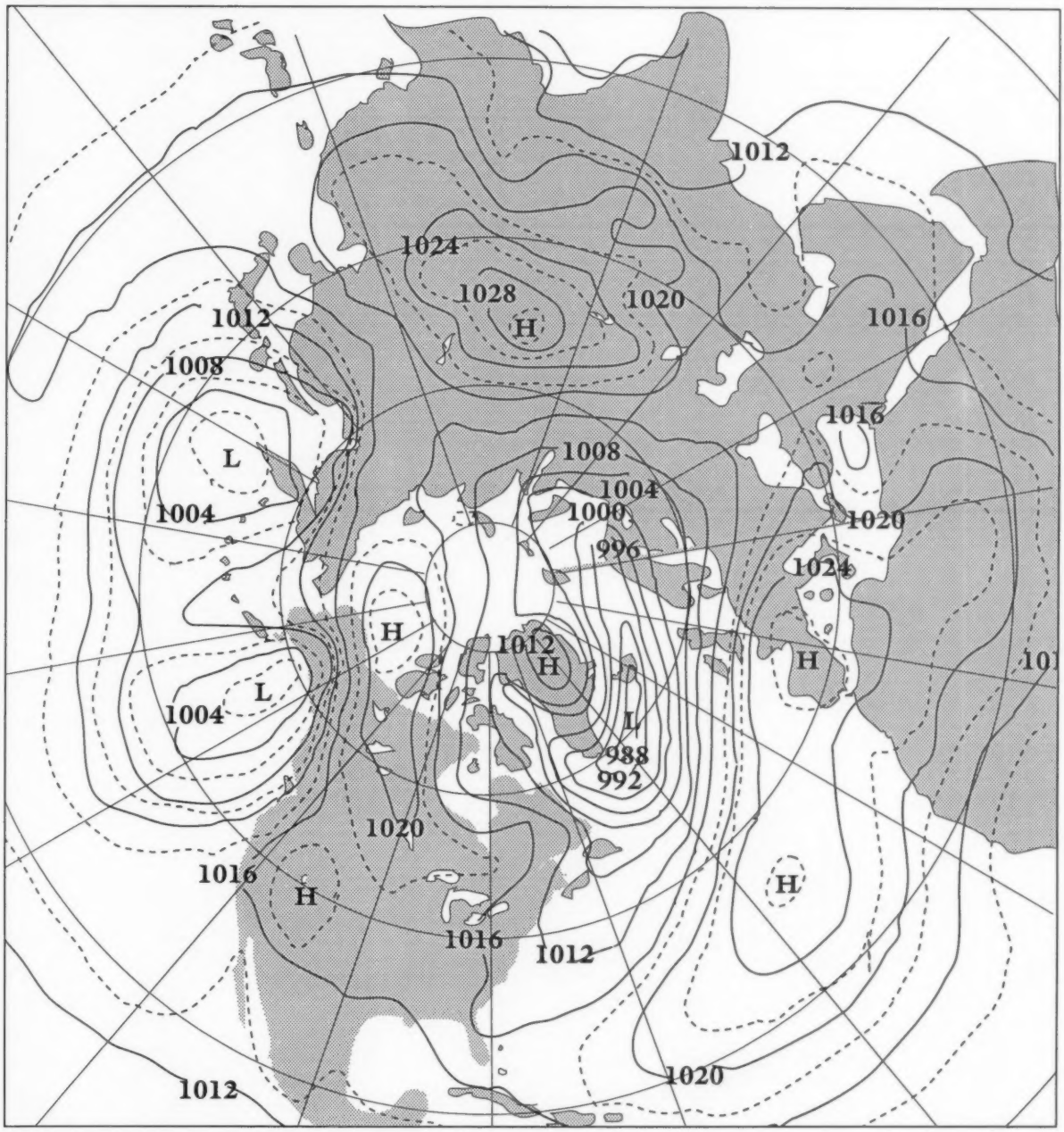
Casualties– The ***Cheog Yang No. 3*** shipped seas while enroute from Busan to the fishing grounds off Japan. The eight member crew abandoned ship and their lifeboat was found by the ***Hojin Maru*** southeast of Iso Saki Lighthouse. Two of the crew members died. When the ***Golden Camia*** foundered northeast of Yap Island in heavy rain and fog, all the crew members were rescued after being spotted by U S Navy aircraft. They were picked up by the bulk carriers ***Oinoussian Strength*** and ***Bel Ombre***.

January 1992



These Charts were Provided by John Kopman and Vernon Kousky of the Climate Analysis Center from the Climate Diagnostics Bulletin.

February 1992



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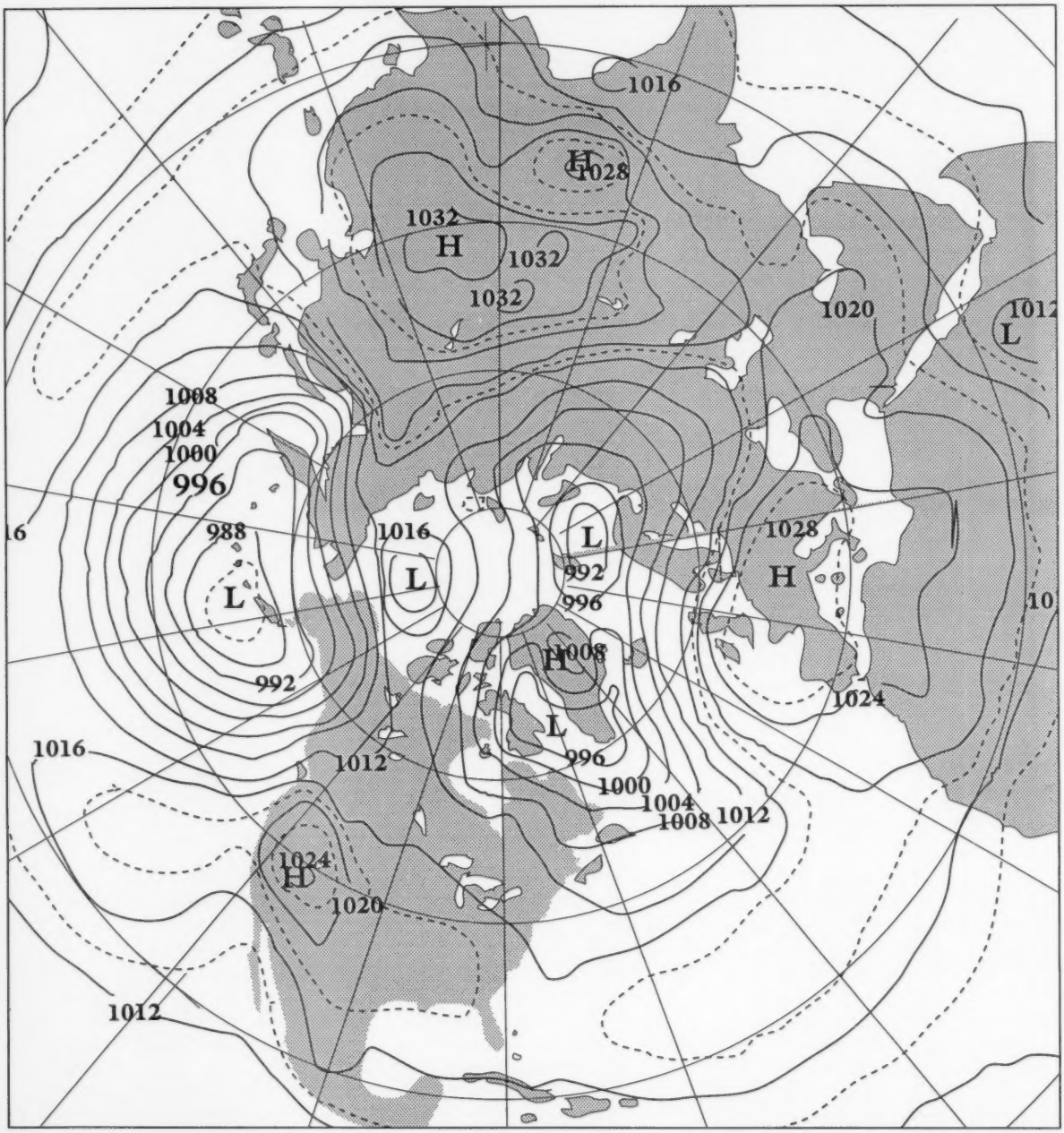

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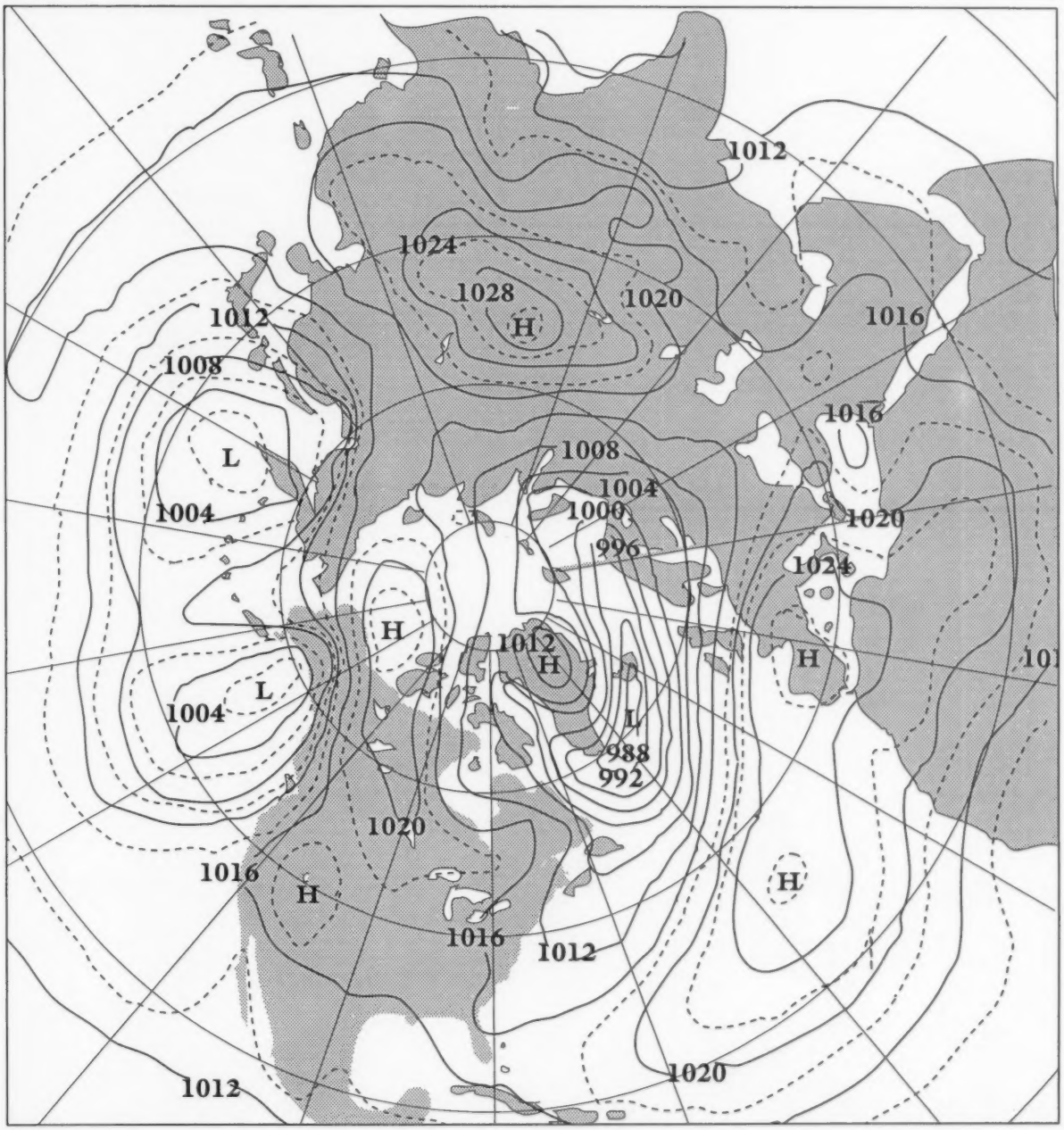
February 1992



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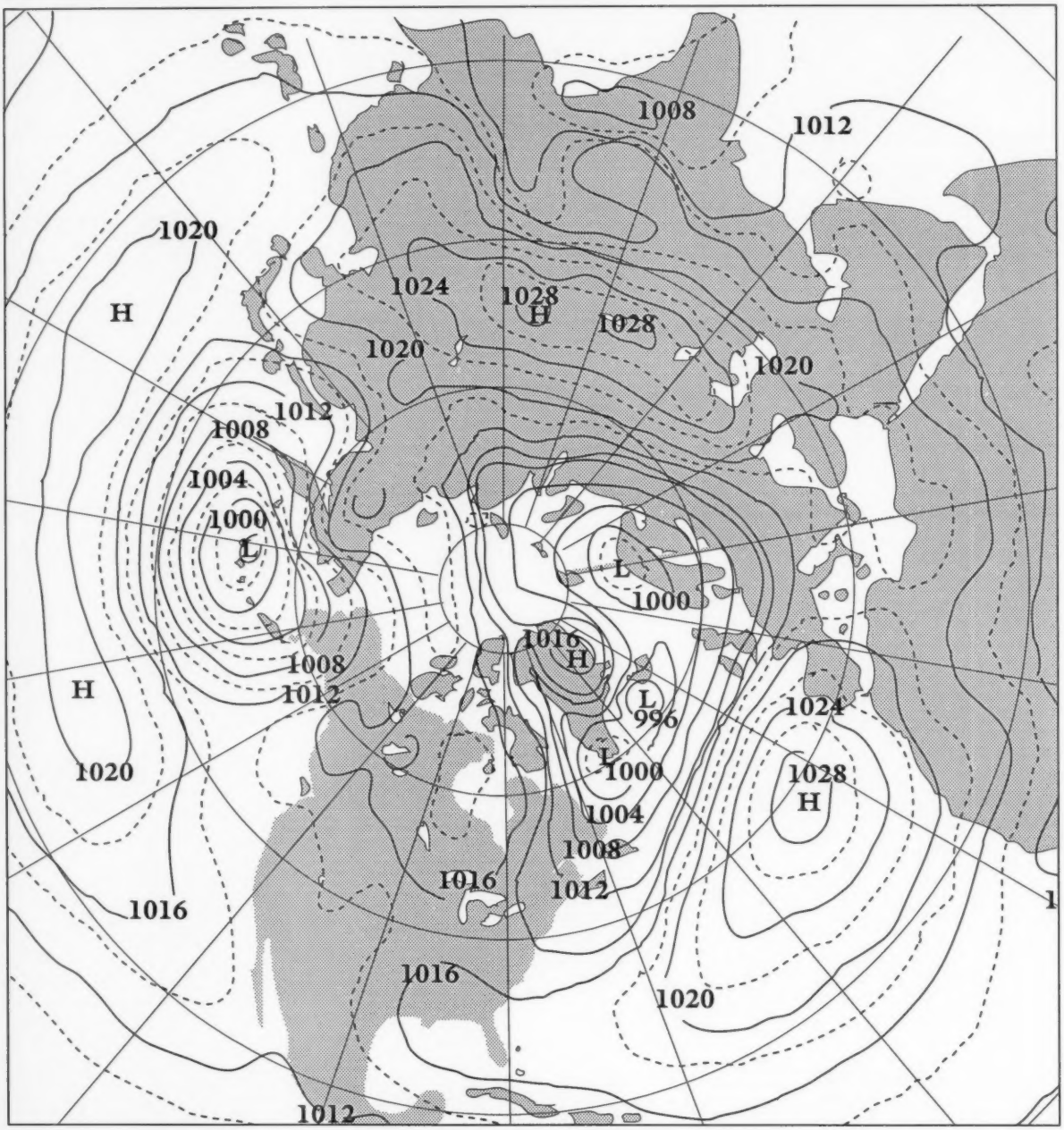
March 1992



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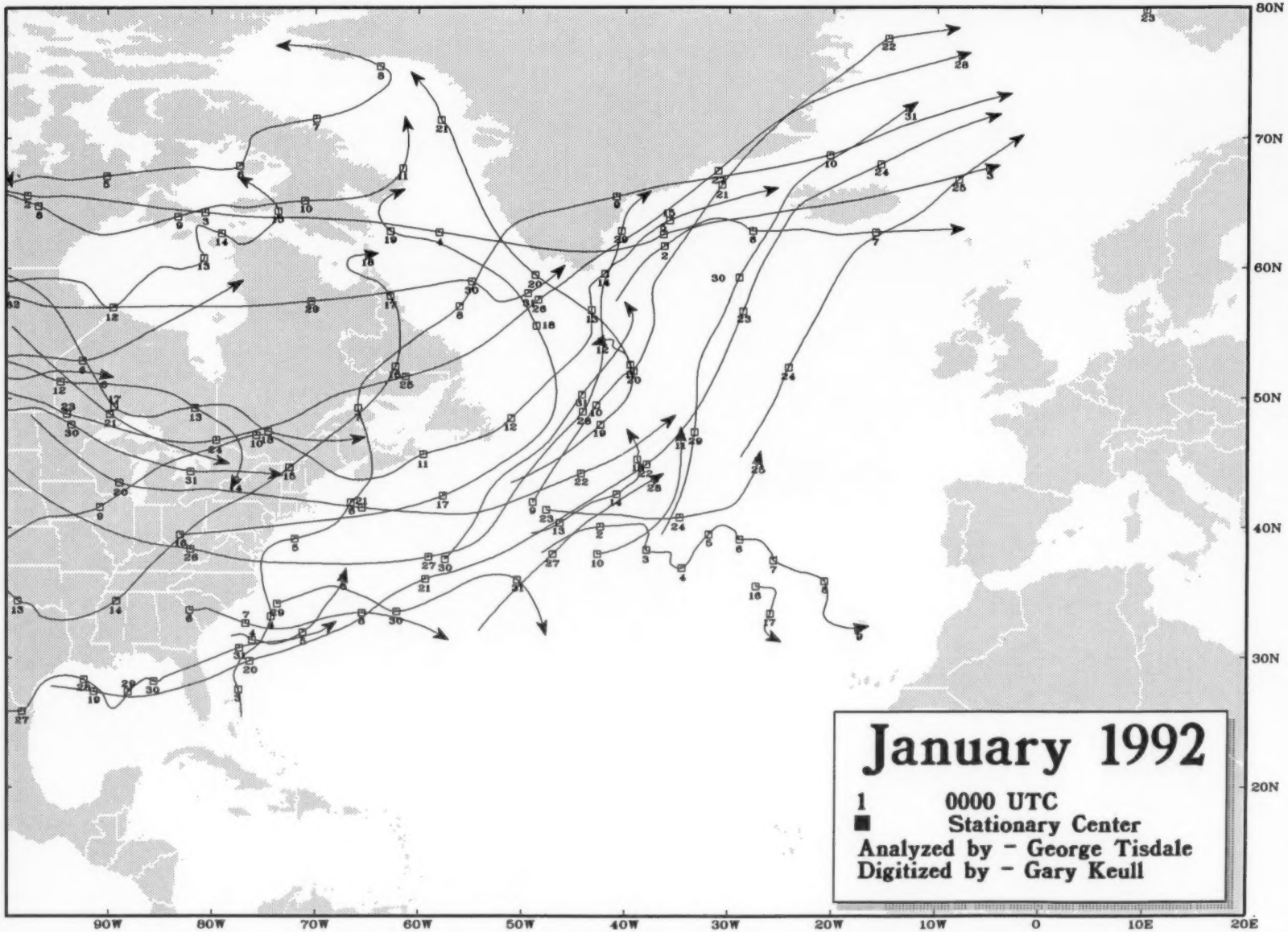
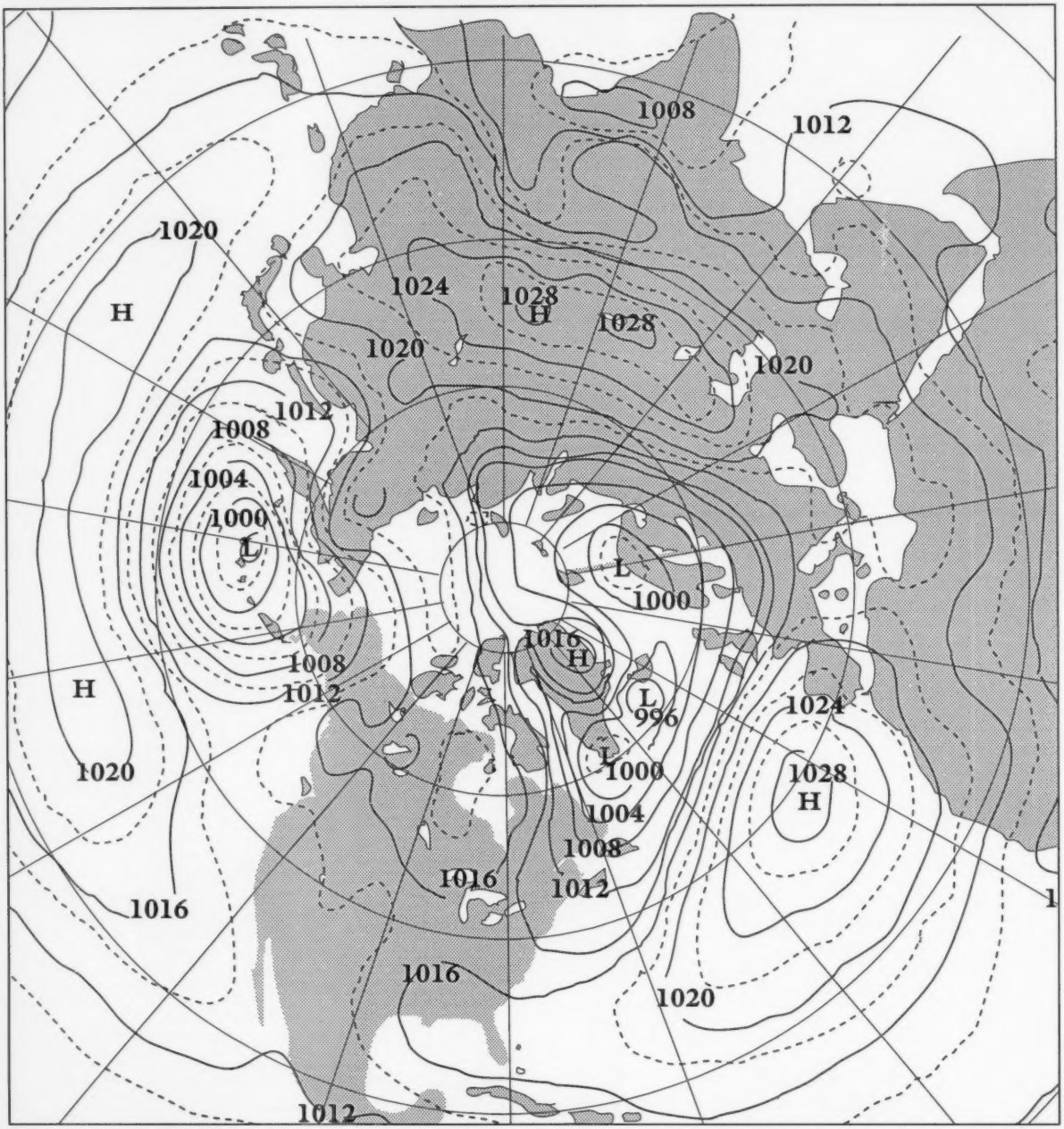
Principal Tracks of Cyclone Centers at Sea Level, North Atlantic



March 1992



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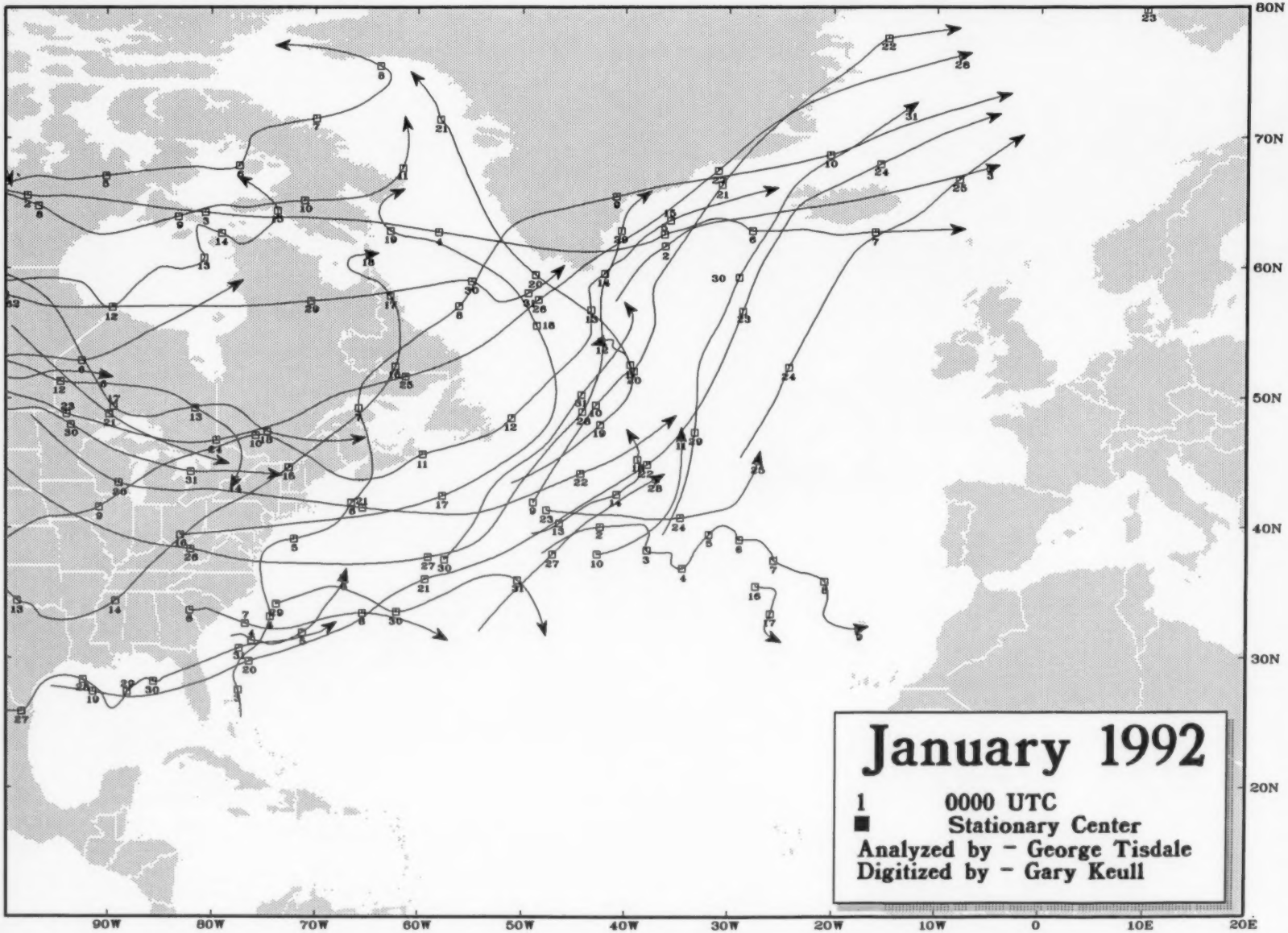

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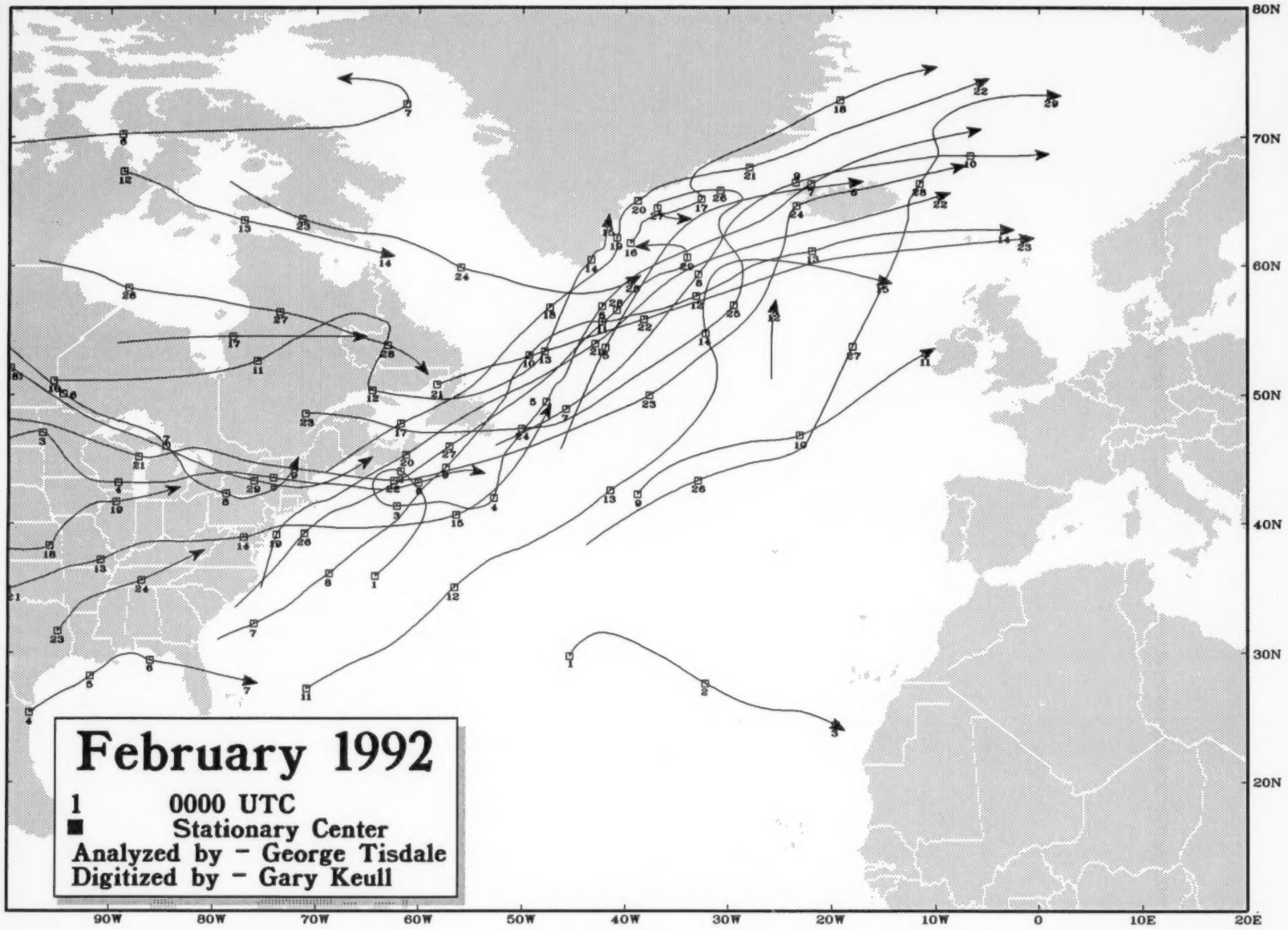

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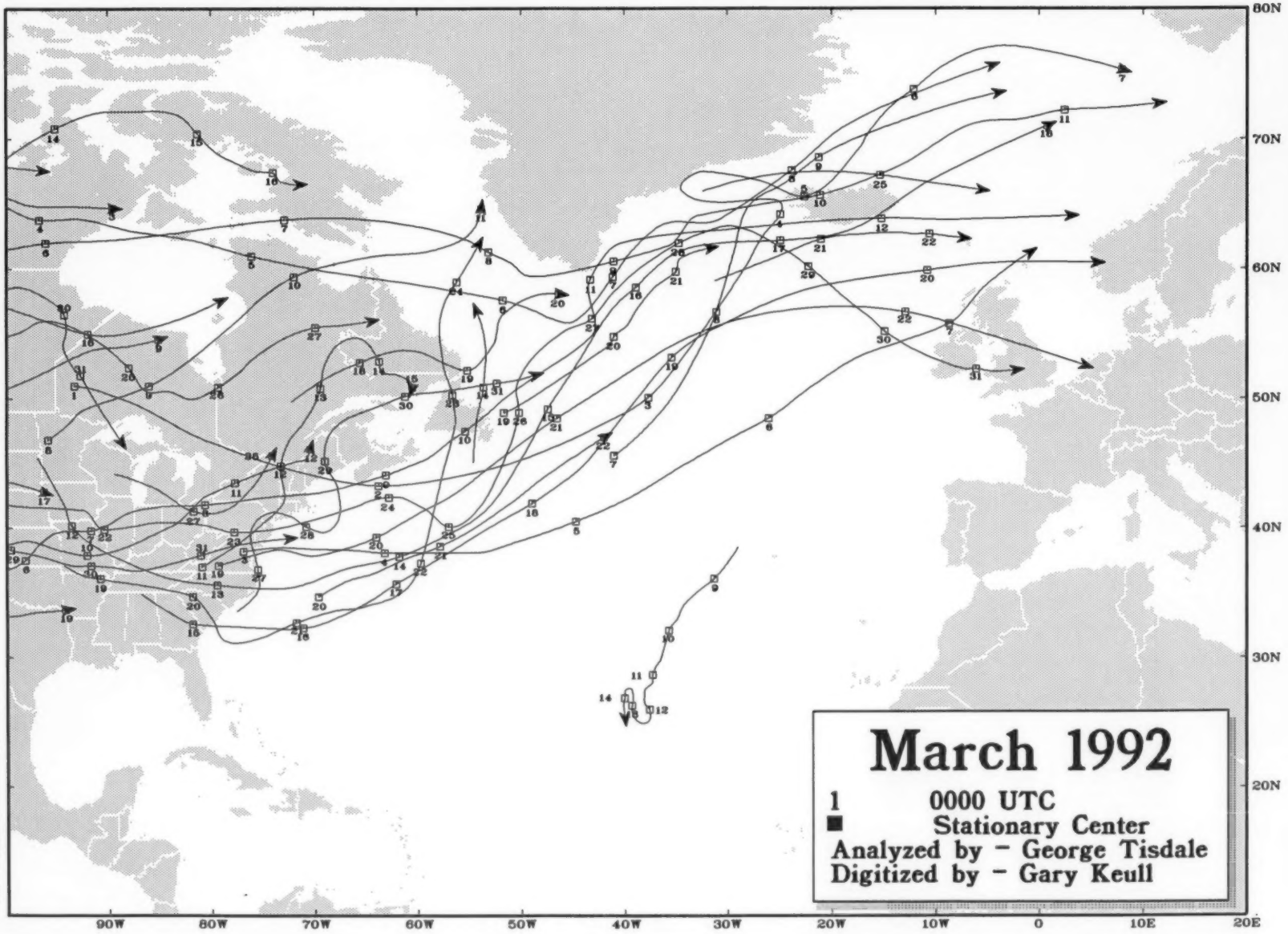

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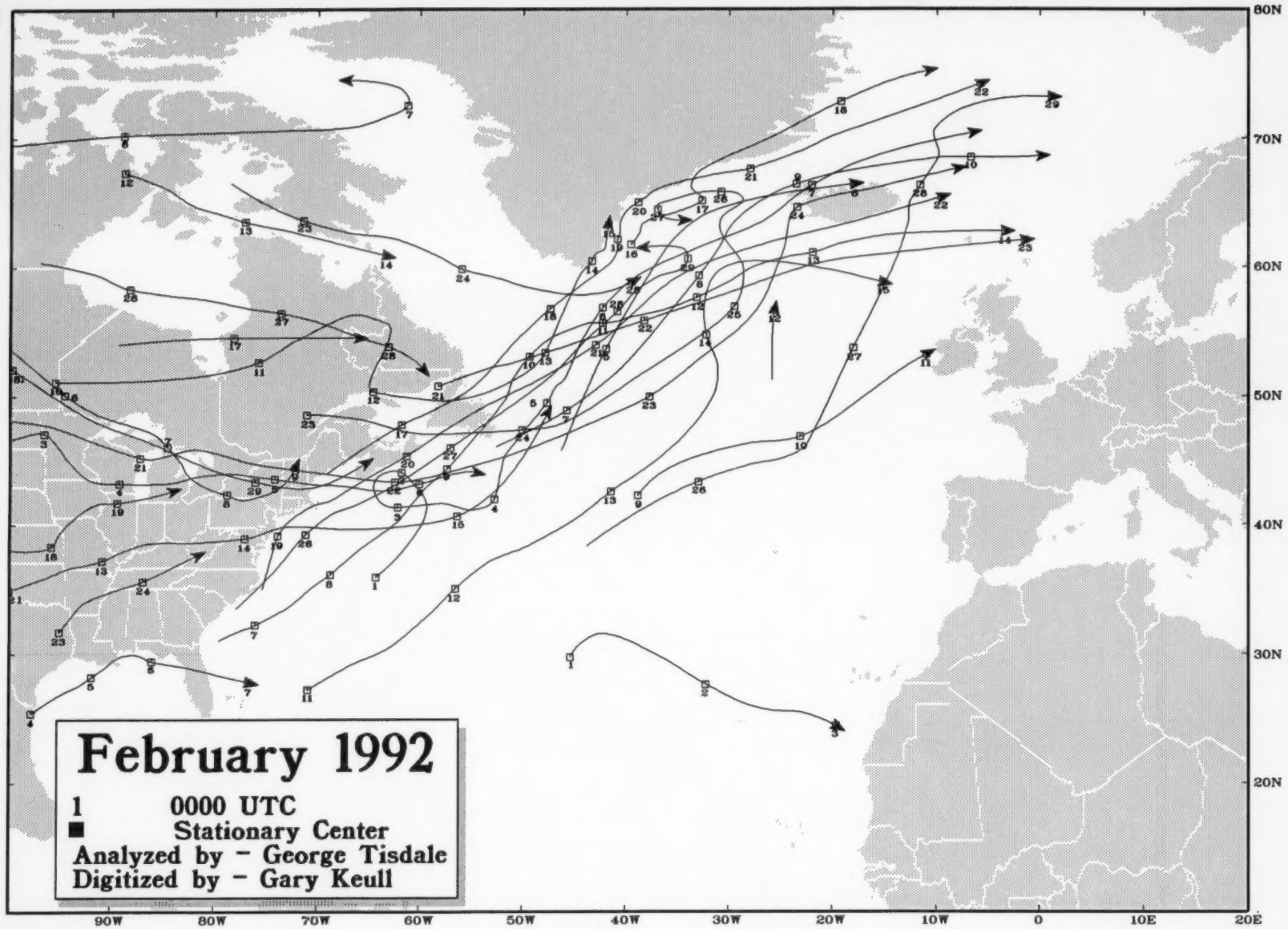

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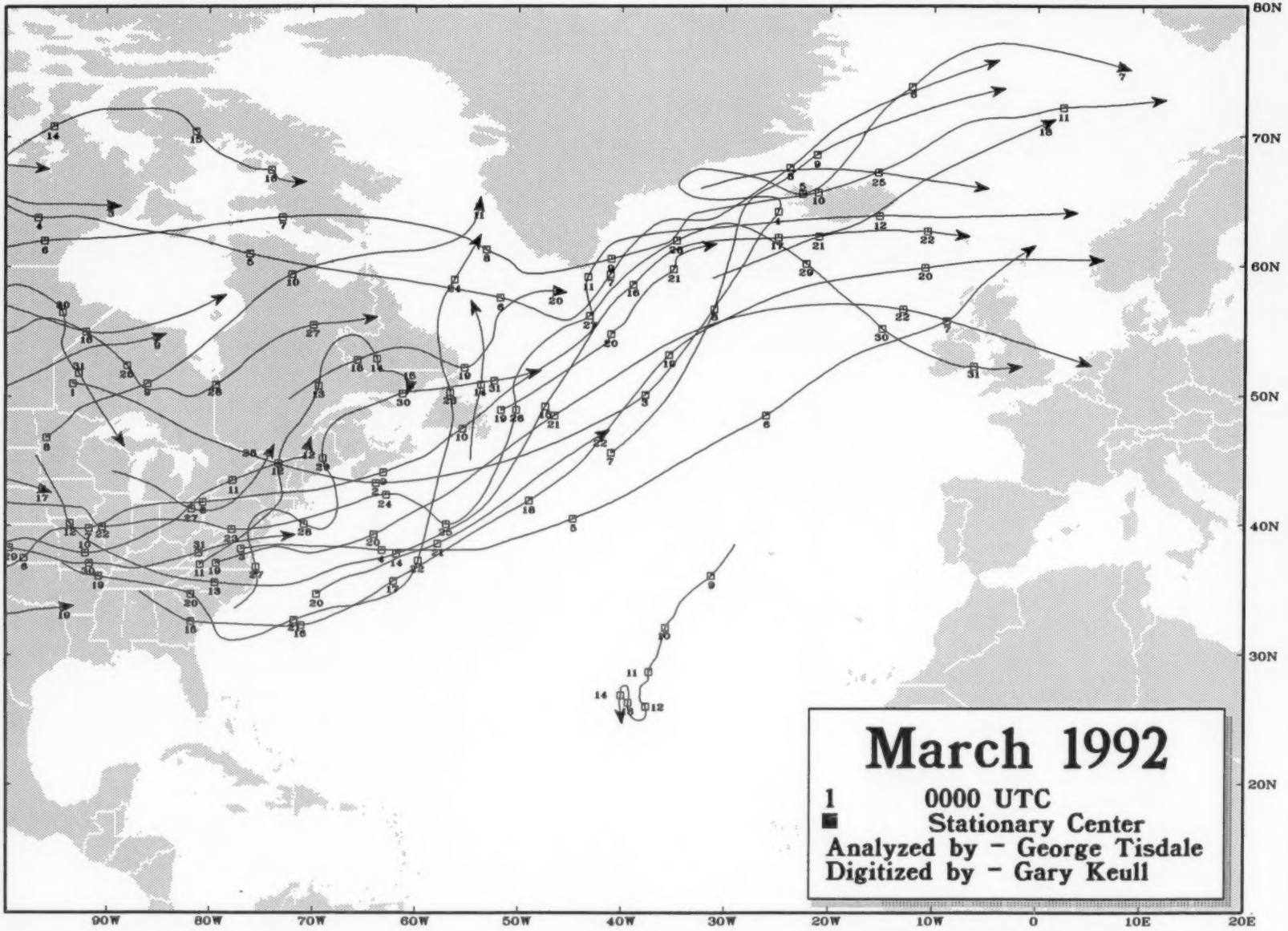
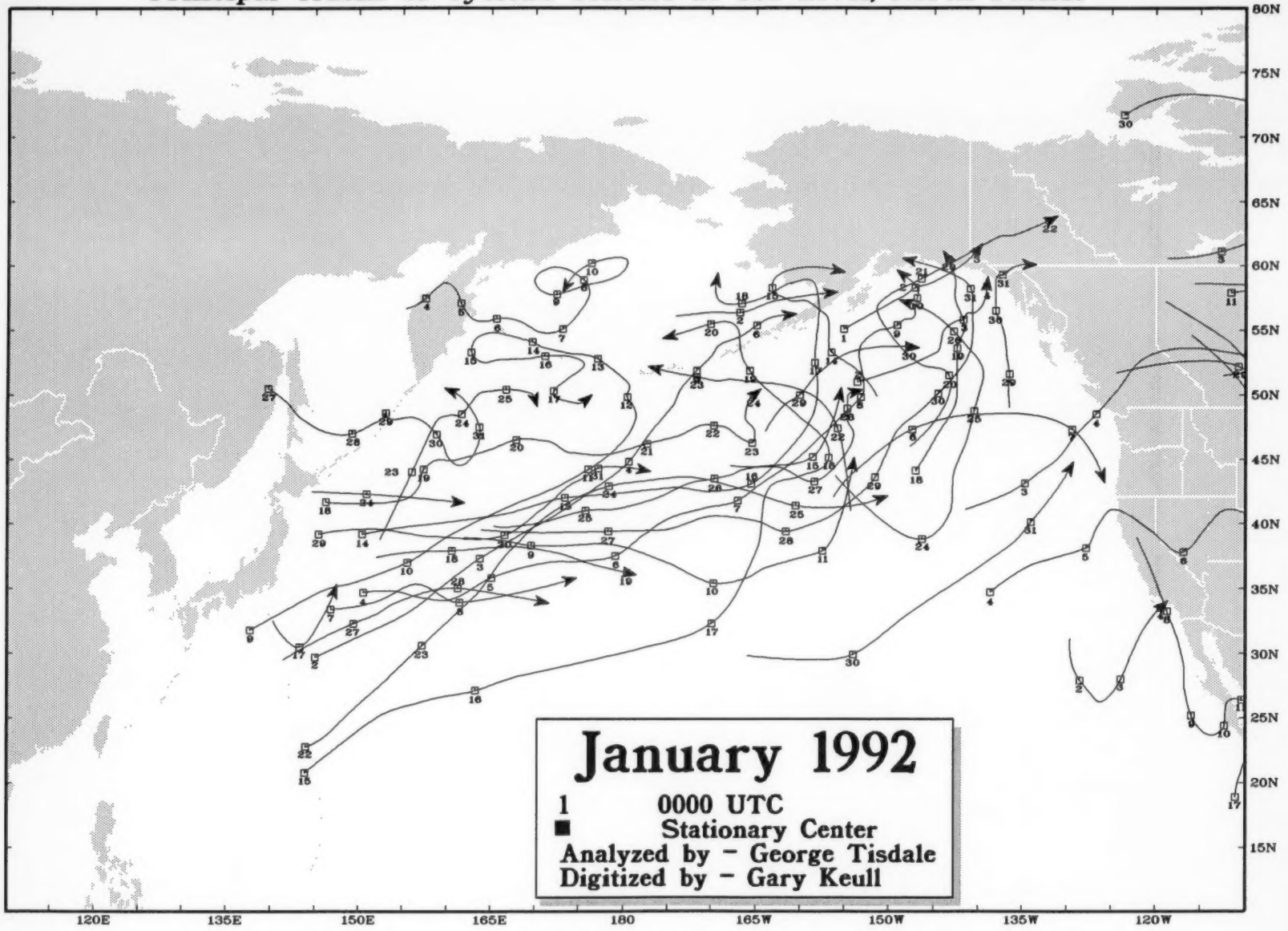
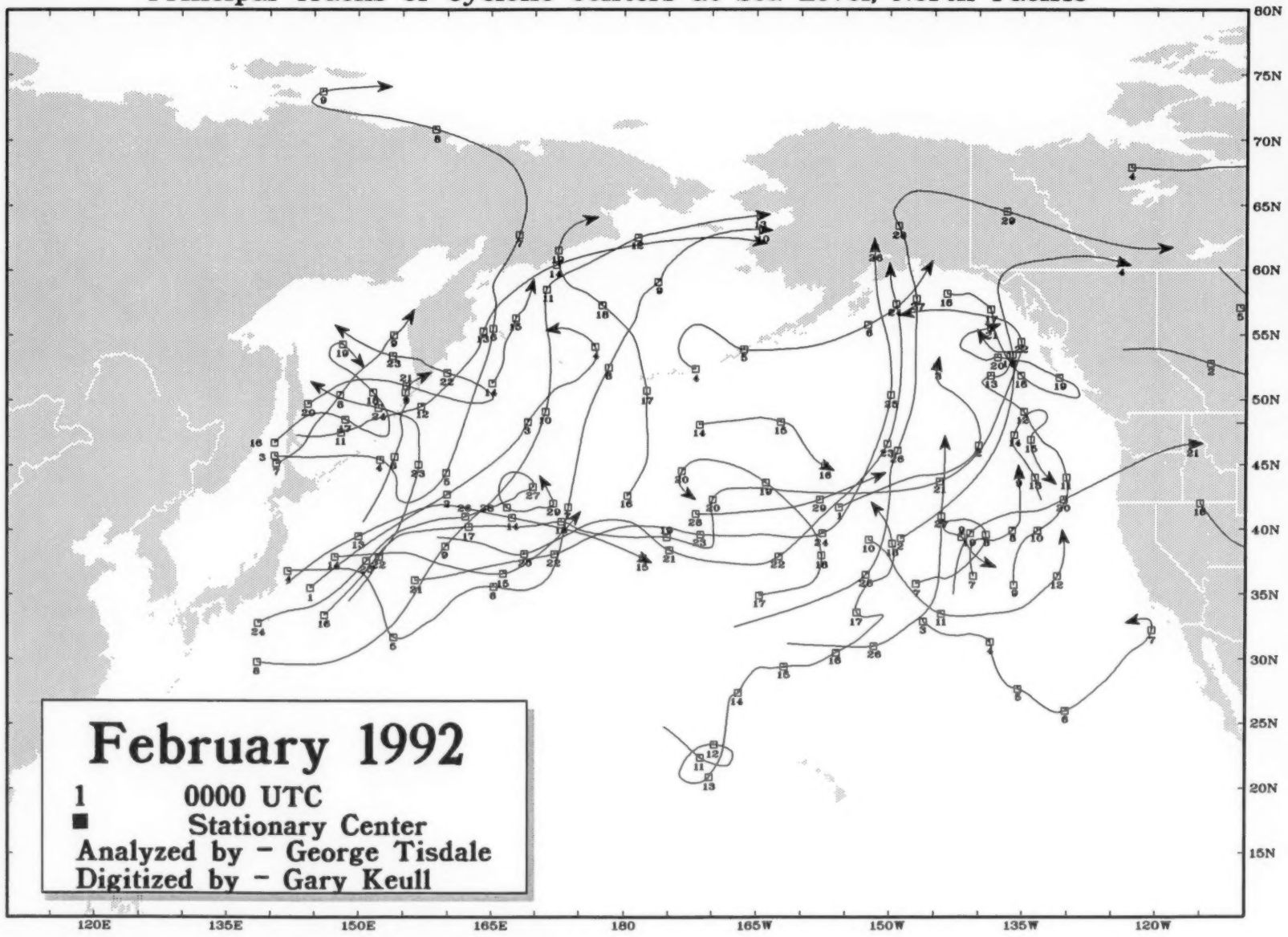


Principal Tracks of Cyclone Centers at Sea Level, North Pacific




Principal Tracks of Cyclone Centers at Sea Level, North Pacific
February 1992
1 0000 UTC
Stationary Center
Analyzed by - George Tisdale
Digitized by - Gary Keull
80N
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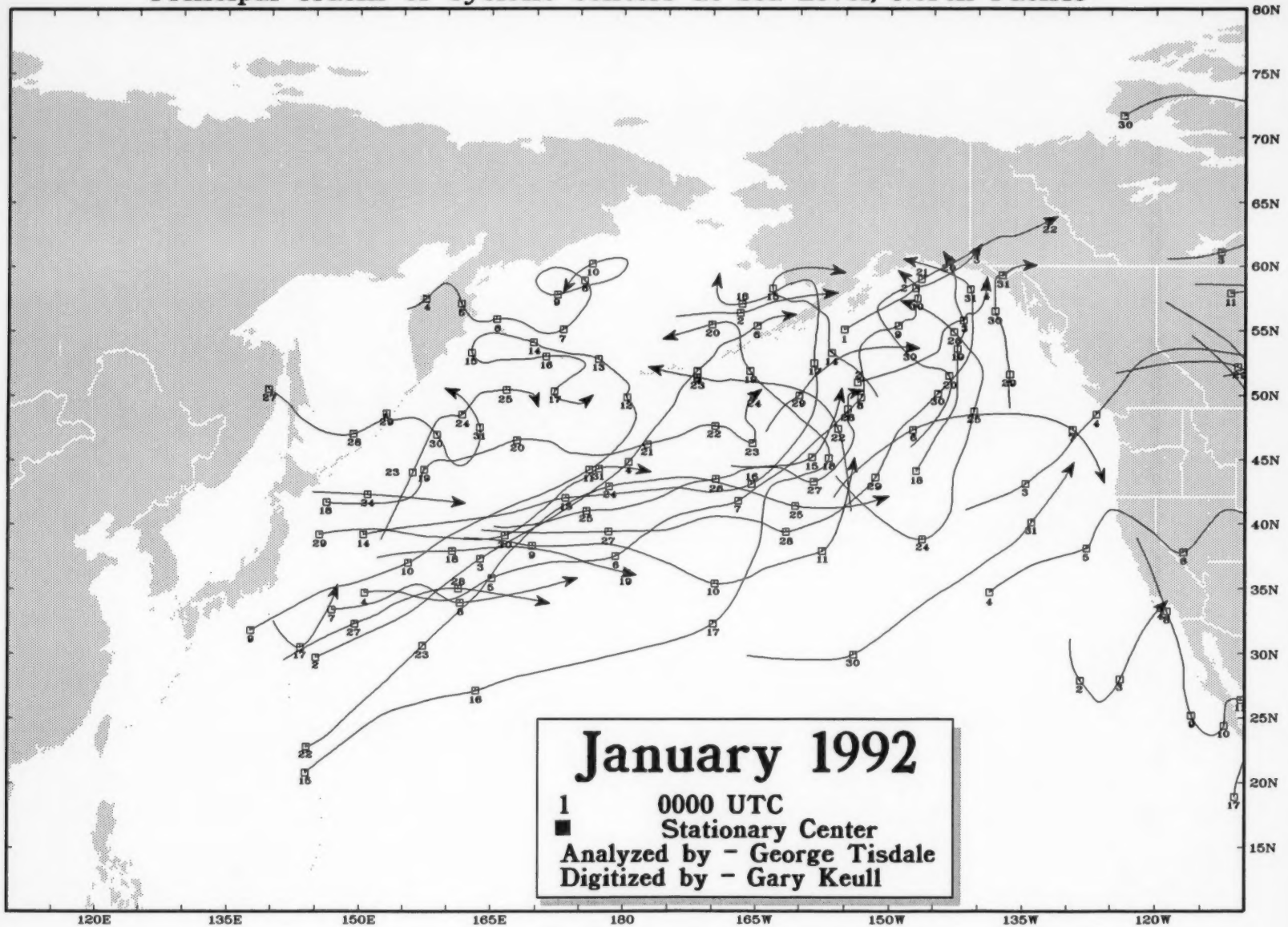
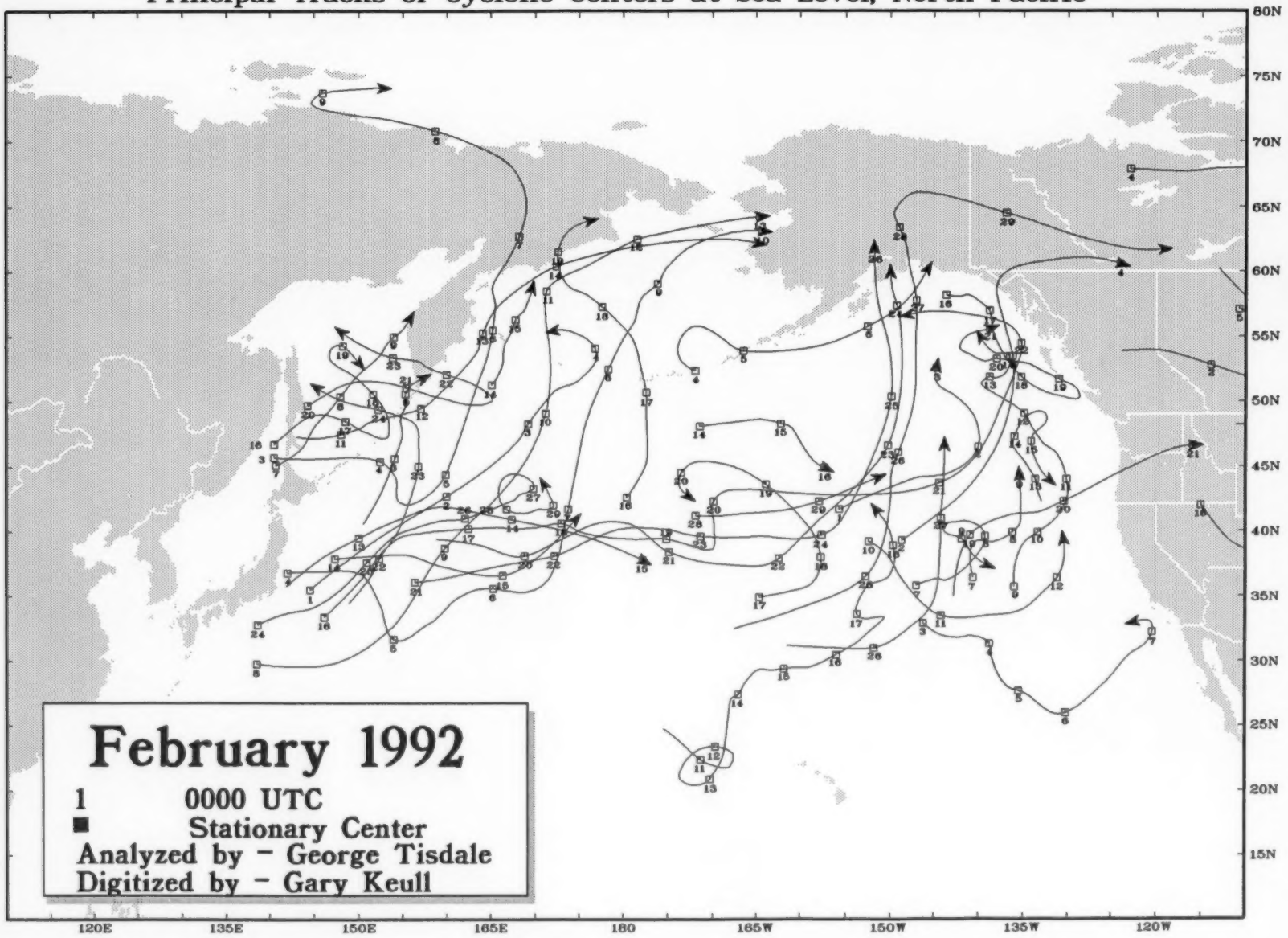
Principal Tracks of Cyclone Centers at Sea Level, North Pacific

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February 1992
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Stationary Center
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80N
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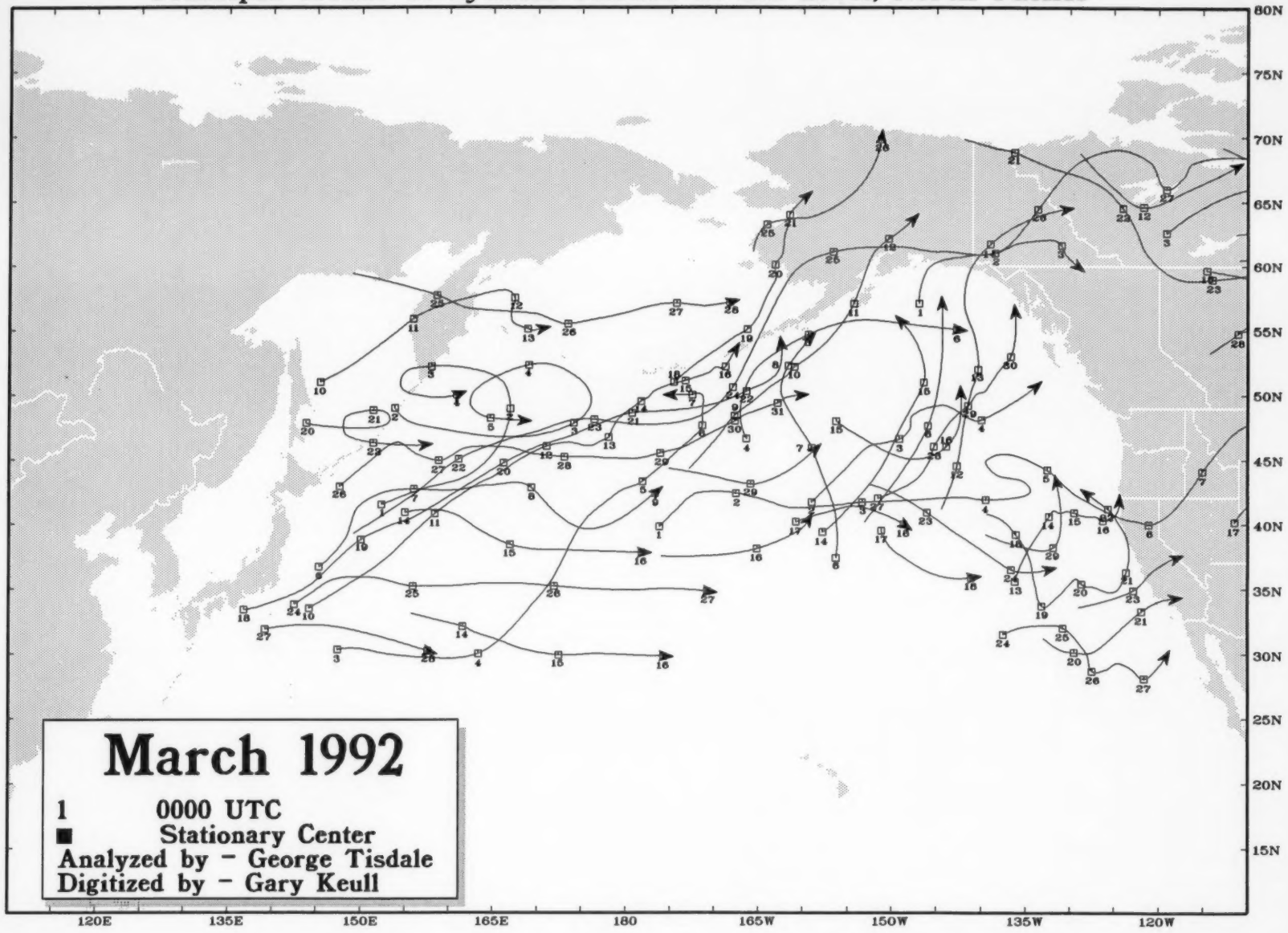
120W

Principal Tracks of Cyclone Centers at Sea Level, North Pacific



January, February, and March 1992

	RADIO	MAIL
1ST LT ALEX BONNYMAN	18	37
2ND LT. JOHN P. BOBO		11
A. V. KASTNER	62	
ACE ACCORD	31	7
ACONCAGUA	16	
ACT 5	99	
ACT 7	200	
ACT I	106	
ADABELLE LYKES	49	101
ADDIRIYAH	38	41
ADMIRALTY BAY	43	79
ADRIAN MAERSK	17	12
ADRIANE-E	2	
ADVANTAGE	39	49
AGNES	43	32
AIDE	38	50
AINO	110	
AL WATTYAH	18	
ALASKA RAINBOW	39	57
ALBERT MAERSK	23	27
ALDEN W. CLAUSEN	39	71
ALEMANIA EXPRESS	32	
ALLIGATOR COLUMBUS	32	23
ALLIGATOR EXCELLENCE	57	
ALLIGATOR FORTUNE	23	23
ALLIGATOR GLORY	26	
ALLIGATOR HOPE	31	88
ALLIGATOR JOY	19	36
ALLIGATOR LIBERTY	62	
ALLIGATOR PRIDE	23	
ALLIGATOR SYMPHONY	5	
ALLIGATOR TRIUMPH	41	39
ALMERIA LYKES	49	29
ALPENA	2	
ALTAMONTE	31	15
AMERICA EXPRESS	56	
AMERICA STAR	152	
AMERICAN CONDOR		104
AMERICAN CORMORANT	34	53
AMERICAN EAGLE	24	
AMERICAN FALCON	78	101
AMERICAN KESTREL	13	
AMERICAN TRADER	115	125
AMERICAN VETERAN	30	
AMERICANA	1	70
AMERIGO VESPUCCI	12	
AMOCO CAIRO	9	
ANDERS MAERSK	19	47
ANNA MAERSK	27	23
ARABIAN SENATOR	55	
ARCO ALASKA	35	31
ARCO ANCHORAGE	33	35
ARCO CALIFORNIA	28	38
ARCO FAIRBANKS	34	
ARCO INDEPENDENCE	24	4
ARCO JUNEAU	26	
ARCO SAG RIVER	23	13
ARCO SPIRIT	16	4
ARCO TEXAS	38	
ARCTIC OCEAN	22	99
ARCTIC TOKYO	29	119
ARGONAUT	45	79
ARIES	3	
ARILD MAERSK	14	12
ARNOLD MAERSK	13	21
ARTHUR M. ANDERSON	2	
ARTHUR MAERSK	39	50
ASHLEY LYKES	6	
ASIAN SENATOR	42	
ASPEN	23	61
ASTRO JYOJIN	100	70
ATIGUN PASS	28	24
ATLANTIC	36	
ATLANTIC CARTIER	60	
ATLANTIC COMPASS	76	
ATLANTIC CONVEYOR	98	
ATLANTIC OCEAN	108	144
ATLANTIS II	29	
ATLAS HIGHWAY	11	
AUSTRAL RAINBOW	1	3
AXEL MAERSK	32	117
AYA II	156	
B.T. ALASKA	50	148
BAAB ULLAH	4	
BACTAZAR	22	70
BALTIMORE TRADER	112	214
BAY BRIDGE	111	153
BEATE OLDENDORFF	3	
BEBEDOURO	20	
BELGIAN SENATOR	34	
BIBI	47	
BLUE HAWK	9	
BLUE SKY	135	
BOGASARI LIMA	304	
BOHOL SAMPAGUITA	18	
BONN EXPRESS	46	
BRAVADO	3	88
BRILLIANT ACE	13	
BROOKLYN BRIDGE	65	44
BROOKS RANGE	62	13
BUCKEYE		2
BUNGA KANTAN	42	23
BUNGA KENANGA	55	
BUNGA MELAWIS	1	
BURNS HARBOR	38	50
BUYER	2	
C.W. KITTO		119
CALIFORNIA APOLLO	15	
CALIFORNIA CERES	98	
CALIFORNIA GALAXY	76	
CALIFORNIA HERMES	42	33
CALIFORNIA HERMES, LIB		26
CALIFORNIA ORION	80	87
CALIFORNIA STAR	134	
CALIFORNIA TRITON	93	23
CANADIAN RAINBOW	52	53
CAPE BLANCO	33	40
CAPE BRETON, USA	14	16
CAPE CARTHAGE	22	
CAPE CATAWBA		129
CAPE FAREWELL	3	
CAPE HENRY	36	
CAPE HUDSON	76	
CAPE JUBY	132	112
CAPE LOBOS	43	
CAPE MAY	24	
CARIBE 1	2	
CARLA A. HILLS	46	173
CARMEL	15	
CAROLINA	9	76
CARTAGENA	87	82
CAVALLINO, PANAMA	22	33
CELEBRATION	31	59
CENTURY HIGHWAY #2	64	
CENTURY HIGHWAY NO. 5	240	
CENTURY HIGHWAY NO.2 P	66	27
CGM ILE DE FRANCE	131	167
CGM LORRAINE	55	
CGM PROVENCE	43	
CHABLIS	32	84
CHACO	4	
CHAITEN	38	
CHARLESTON	55	32
CHARLOTTE LYKES	89	156
CHEMICAL PIONEER	71	82
CHERRY VALLEY	60	46
CHESAPEAKE TRADER	48	
CHESNUT HILL	24	29
CHEVRON BURNABY	94	39
CHEVRON CALIFORNIA	52	5
CHEVRON COLORADO	50	68
CHEVRON COPENHAGEN		51
CHEVRON EDINBURGH	14	21
CHEVRON FELUY		113
CHEVRON HORIZON		46
CHEVRON METEOR	53	91
CHEVRON MISSISSIPPI	93	155
CHEVRON NAGASAKI		184
CHEVRON OREGON	85	171
CHEVRON PACIFIC	23	271
CHEVRON SKY		48
CHEVRON SUN		224
CHEVRON WASHINGTON	55	89
CHICKASAW	65	81
CHINA GLORY	19	
CHINA PRIDE	43	
CHIQUITA BOCAS	92	
CHIQUITA CINCINNATION	35	68
CHO YANG SUCCESS	18	11
CLEMENTINA	10	
CLEVELAND		126
CO-OP EXPRESS III	52	
COASTAL CORPUS CHRISTI	28	53
COASTAL EAGLE POINT	5	
COLIMA	19	89
COLUMBIA STAR	126	
COLUMBINE	38	67
COLUMBUS AMERICA	177	
COLUMBUS AUSTRALIA	92	
COLUMBUS LOUISANA	103	
COLUMBUS NEW ZEALAND	38	
COLUMBUS OHIO	171	74
COLUMBUS OLIVOS	76	106
COLUMBUS QUEENSLAND	52	
COLUMBUS VICTORIA	222	
COLUMBUS VIRGINIA	231	
COLUMBUS WELLINGTON	137	
COMPANION EXPRESS	54	
CONCERT EXPRESS	82	
CONSENSUS SEA	7	
CONTIENTAL WING	78	69
CONTINENTAL RELIANCE	113	
CONTINENTAL SPIRIT	83	
CORAH ANN	65	124
CORMORANT ARROW	3	
CORNHUSKER STATE	39	
CORNUCOPIA	27	115
CORONADO	7	
CORWITH CRAMER	79	10
COURIER	25	
CPL. LOUIS J. HAUGE JR	15	32
CRISTOFORO COLOMBO	32	39
CSS HUDSON	59	
DAN MOORE	1	
DELAWARE TRADER	38	69
DIAMOND STATE	49	98
DIANA	16	31
DILIGENCE TRADER	1	
DIRECT KIWI	86	68
DIRECT KOOKABURRA	22	152
DON JORGE	24	
DONAIRE		258
DSR OAKLAND	109	
DSR YOKOHAMA	108	
DUSSELDORF EXPRESS	111	
DYVI OCEANIC	9	
EASTERN GLORY	27	
EASTERN VENTURE	92	129
ECSTASY	39	10
EDEN	22	44
EDGAR B. SPEER	42	45
EDWARD L. RYERSON	7	8
EDWIN H. GOTT	23	32
EDYTH L.	30	5
ELIZABETH LYKES	36	91
ENDEAVOR	97	53
ENVOYAGER	4	
EQUALITY STATE	25	
ESPERANCE	40	
ESSO PUERTO RICO	24	
ETERNITY	41	
EUROPEAN SENATOR	35	
EVER GAINING	5	3
EVER GALLANT	4	
EVER GARDEN	17	
EVER GARLAND	12	
EVER GATHER	54	26
EVER GENTLE	2	
EVER GIANT	12	12
EVER GIFTED	10	14
EVER GIVEN	10	
EVER GLAMOUR	5	28
EVER GLEAMY	2	

	RADIO	MAIL
EVER GLEEFUL	17	
EVER GLORY	8	
EVER GLOWING	8	
EVER GOING	10	10
EVER GOODS	8	8
EVER GRACE	6	
EVER GRADE	9	16
EVER GUARD	17	1
EVER GUEST	16	
EVER LAUREL	25	10
EVER LEVEL	40	
EVER LINKING	9	9
EVER LIVING	10	7
EXPORT FREEDOM	43	114
EXPORT PATRIOT	57	113
EXXON BATON ROUGE	27	49
EXXON BENICIA	37	14
EXXON CHARLESTON	16	
EXXON LONG BEACH		4
EXXON MEDITERRANEAN	1	
EXXON NEW ORLEANS	3	9
EXXON PHILADELPHIA	27	9
EXXON SAN FRANCISCO	38	46
EXXON WILMINGTON	1	
FARNELLA	26	
FAUST	48	99
FERNCROFT	81	125
FESTIVALE	33	30
FETISH	82	122
FLEMMING SIF	24	30
FLICKERTAIL STATE	29	37
FLORIDA RAINBOW	14	37
FRANCES HAMMER	87	
FRANCES L.	124	15
FRED R. WHITE JR		1
FUJI	61	
GALVESTON BAY	77	106
GEMINI	14	21
GENEVIEVE LYKES	27	20
GEORGE A. STINSON	1	4
GEORGE WASHINGTON BRID	215	75
GEORGIA		72
GEORGIA RAINBOW II	30	12
GERMAN SENATOR	56	
GERONIMO	2	
GLACIER BAY	45	64
GLOBAL LINK	108	
GLOBAL SENTENIAL	9	
GLORIOUS SPICA	1	
GOLDEN APO	22	
GOLDEN BEAR	158	69
GOLDEN GATE	1	
GOLDEN GATE BRIDGE	202	57
GOLDEN HAWK	89	154
GOLDEN MONARCH	38	
GOLDEN TOPAZ	13	89
GREAT LAND	221	251
GREAT RIVER	28	92
GREEN BAY	53	26
GREEN HARBOUR	11	41
GREEN ISLAND	32	62
GREEN KOBE	18	37
GREEN LAKE	100	77
GREEN RIDGE	69	111
GREEN SAIKAI	10	52
GREEN SASEBO	4	40
GREEN SUMA	36	102
GREEN VALLEY	11	
GREEN WAVE	11	83
GUANAJUATO	150	
GUAYAMA	3	
GULF BANKER	3	87
GULF SPEED	74	
GULF SPIRIT	85	
GULF TRADER	6	
GYPSUM BARON	116	
GYPSUM KING	138	
HANEI SKY	5	65
HANJIN BUSAN	28	
HANJIN CHUNGMU	11	
HANJIN FELIXSTOWE	11	
HANJIN HAMBURG	4	
HANJIN KAOHSIUNG	3	
HANJIN KEELUNG	12	
HANJIN KOBE	29	
HANJIN LE HAVRE	17	
HANJIN LONG BEACH	3	
HANJIN NEW YORK	11	
HANJIN OAKLAND	8	
HANJIN POHANG	55	23
HANJIN SAVANNAH	13	
HANJIN SEATTLE	11	
HANJIN SEOUL	28	17
HANJIN TONGHAE	48	
HANJIN VANCOUVER	11	
HANJIN YOKOHAMA	31	
HANNOVERLAND	14	
HANSA LUBECK	41	
HANSA VISBY	9	
HAWAIIAN EXPRESS	54	43
HAWAIIAN RAINBOW	50	
HEIDELBERG EXPRESS	23	
HELM STAR	6	
HENRY HUDSON BRIDGE	210	
HERMENIA	81	102
HESIOD	46	
HIRA II	8	
HOEGH CAIRN	3	
HOEGH CLIPPER	12	
HOEGH DRAKE	16	35
HOEGH DUKE	19	
HOEGH DYKE	10	
HOEGH MIRANDA	13	33
HOLIDAY	19	
HONOLULU	31	
HORNSTREAM	105	54
HOWELL LYKES	35	96
HUAL ANGELITA	1	
HUAL LISITA	61	54
HUMACAO	39	43
HYUNDAI #203	28	
HYUNDAI CHALLENGER	34	28
HYUNDAI COMMANDER	19	9
HYUNDAI CONTINENTAL	43	
HYUNDAI EXPLORER	1	
HYUNDAI INNOVATOR	23	
HYUNDAI NO 102	33	
HYUNDAI PIONEER	15	
IBIS ARROW	11	
INDEPENDENT SPIRIT	100	
INDIAN OCEAN	44	80
INFANTA	65	
INGER	46	76
ISLAND PRINCESS	89	
ITB BALTIMORE	57	104
ITB NEW YORK	76	109
IVER EXPLORER	75	
IVER EXPRESS	33	
J.DENNIS BONNEY,MONRAV	1	105
JACKSONVILLE	66	114
JALAGOPAL	1	
JALISCO	19	64
JAMES LYKES	24	10
JAPAN RAINBOW 2	51	56
JAPAN SENATOR	39	
JEAN LYKES	53	84
JO BIRK	110	
JO BRIED	16	
JO CLIPPER	37	
JO LONN	84	
JOANN M	64	
JOHN LYKES	65	75
JOHN V. VICKERS	144	169
JOHN YOUNG		146
JOSEPH L. BLOCK	33	
JULIUS HAMMER	42	45
K. TOPIC	1	
KAIMOKU	58	210
KAINULA	97	214
KATHLEEN PEARCY	31	31
KAUAI	93	200
KAYE E. BARKER	5	9
KEE LUNG	16	
KEISHO MARU	40	
KEN RYU	23	
KENAI	27	154
KENNETH E. HILL	3	64
KENNETH T. DERR	41	133
KENTUCKY HIGHWAY	19	
KEYSTONE CANYON	111	46
KEYSTONER	46	121
KITTANING	1	
KOKUA	238	209
KOLN ATLANTIC	179	
KOPER EXPRESS	6	
KOYAGI SPIRIT	20	45
KRAS	93	74
KUROBE	25	
LA TRINITY		41
LAKE	28	84
LANCASHIRE	1	
LASH ATLANTICO	1	11
LAUST MAERSK	51	124
LAWRENCE H. GIANELLA	32	9
LEONARD J. COWLEY	110	
LERMA	198	
LESLIE LYKES	33	50
LETITIA LYKES	61	26
LIBERTY STAR	32	67
LIBERTY SUN	43	113
LIBERTY WAVE	30	68
LIRCAY	78	
LNG AQUARIUS	14	
LNG CAPRICORN	3	17
LNG LEO	65	88
LNG LIBRA		17
LNG TAURUS	12	96
LNG VIRGO	2	
LONG LINES	24	
LOTUS ACE	56	
LOUIS MAERSK	29	41
LOUISE LYKES	16	69
LT. ODYSSEY	6	
LURLINE	67	195
LYRA	44	108
M. P. GRACE	1	
M.V.CARRIBEAN EMERALD,	1	71
MAASSLOT	130	
MAASSTROOM	87	
MACKINAC BRIDGE	161	54
MADISON MAERSK	18	111
MAERSK COMMANDER	98	
MAERSK CONSTELLATION	59	91
MAERSK PINE	109	120
MAERSK SUN	36	71
MAERSK WIND	70	63
MAGIC	60	
MAGLEBY MAERSK	38	
MAJESTIC MAERSK	24	54
MANHATTAN BRIDGE	113	
MANUKAI	52	187
MANULANI	47	173
MANYAS-1	36	46
MARATHA MAJESTY	22	
MARCHEN MAERSK	25	
MAREN MAERSK	15	32
MARGARET LYKES	37	77
MARGRETHE MAERSK	26	80
MARIE MAERSK	47	87
MARIF	37	36
MARINE RELIANCE	22	80
MARIT MAERSK	2	5
MARITIME LIGHT	7	
MARJORIE LYKES	68	42
MARLIN		71
MASON LYKES	29	103
MATHILDE MAERSK	44	97
MATSONIA	74	179
MAUI	180	121
MAURICE EWING	164	78
MAYAGUEZ	22	35
MAYVIEW MAERSK	12	30
MC-KINNEY MAERSK	13	63
MEDALLION	123	138
MEDUSA CHALLENGER	47	10
MELBOURNE HIGHWAY	11	
MELBOURNE STAR	78	
MELVILLE	3	25
MEONIA	96	97
MERCANDIAN CONTINENT	47	15
MERCANDIAN SUN II	57	8
MERCHANT PRELUDE	2	
MERCURY ACE	24	
MERIDA	27	29
MERKUR AMERICA	37	
MERKUR PORTUGAL	78	
METTE MAERSK	23	47
MICHIGAN HIGHWAY	14	
MICHIGAN,USA	74	112
MICRONESIAN COMMERCE	69	76
MICRONESIAN INDEPENDEN	120	
MINDORO SAMPAGUITA	11	
MINERVA	1	

	RADIO	MAIL
MING PLEASURE	18	
MING SUN	12	
MING UNIVERSE	14	
MITLA	13	169
MOANA PACIFIC	58	60
MOANA WAVE	181	
MONTE CERVANTES	50	
MONTERREY	81	63
MORELOS	102	88
MORMACSKY	26	
MORMACSTAR	55	60
MORMACSUN	35	87
MV/TORM FREYA,DENMARK	31	37
NACIONAL SANTOS	2	
NACIONAL VITORIA	72	
NAPIER STAR	86	
NARA	56	113
NATIONAL DIGNITY	25	70
NATIONAL HONOR	21	10
NATIONAL PRIDE	29	46
NCC ARAR	15	24
NECHES	5	
NEDLLOYD BALTIMORE	30	
NEDLLOYD BANGKOK	42	
NEDLLOYD BARCELONA	10	
NEDLLOYD HOLLAND	44	115
NEDLLOYD HONG KONG	113	
NEDLLOYD HUDSON	68	164
NEDLLOYD MADRAS	137	
NEDLLOYD MANILA	112	
NEDLLOYD ROTTERDAM	89	
NEDLLOYD ROUEN	175	
NEDLLOYD VAN CLOON	42	
NEDLLOYD VAN DIEMEN	96	
NEDLLOYD VAN NOORT	64	
NEPTUNE ACE	30	
NEPTUNE AGATE	38	
NEPTUNE AMBER	38	
NEPTUNE CORAL	24	
NEPTUNE CRYSTAL	39	
NEPTUNE DIAMOND	130	
NEPTUNE GARNET	7	
NEPTUNE JADE	16	
NEPTUNE PEARL	6	
NEW DUQUESA	89	
NEW HORIZON	48	50
NEW YORK SENATOR	79	
NEWARK BAY	48	114
NIEUW AMSTERDAM	54	
NIPPON HIGHWAY	36	
NOAA DAVID STARR JORDA	3	141
NOAA SHIP ALBATROSS IV	116	85
NOAA SHIP CHAPMAN	198	208
NOAA SHIP DELAWARE II	321	
NOAA SHIP DISCOVERER O	260	276
NOAA SHIP FERREL	8	
NOAA SHIP M. BALDRIDGE	317	82
NOAA SHIP MILLER FREEM	294	341
NOAA SHIP MT MITCHELL	206	468
NOAA SHIP OREGON II	225	243
NOAA SHIP RAINIER	34	
NOAA SHIP SURVEYOR	136	95
NOAA SHIP T. CROMWELL	55	256
NOAA SHIP WHITING	42	44
NOBEL STAR	57	
NOBLE ACE	5	94
NOSAC EXPLORER	36	82
NOSAC EXPRESS	30	
NOSAC RANGER	61	83
NOSAC TAI SHAN	17	22
NOSAC TAKAYAMA	43	54
NUEVO SAN JUAN	10	9
NURNBERG ATLANTIC	73	
NYK STARLIGHT	69	
OAXACA	76	91
OBO ENGIN	15	
OBOD	14	
OCEAN ASPIRATION	37	177
OCEAN BRIDGE	26	
OCEAN CHEER	38	
OCEAN CONQUEROR	20	159
OCEAN HIGHWAY	24	
OCEAN ISLAND	13	20
OCEAN LILY	25	
OCEAN OPAL	28	30
OCEAN SEL	11	
OCEAN SPIRIT	74	
OCEAN VICTOR	11	
OLEANDER	159	131
OLGA TOPIC	48	
OMI CHAMPION	18	
OMI CHARGER	2	
OMI MISSOURI	27	147
OMI WABASH	50	56
OOCL BRAVERY	99	
OOCL EDUCATOR	43	30
OOCL ENVOY	37	69
OOCL EXECUTIVE	44	46
OOCL EXPLORER	68	80
OOCL EXPORTER	81	
OOCL FAIR	27	53
OOCL FAITH	58	
OOCL FORTUNE	80	181
OOCL FREEDOM	158	
OOCL FRIENDSHIP	43	16
ORANGE BLOSSOM	15	
ORANGE STAR	81	111
ORCHID	17	158
OREGON RAINBOW II	38	40
ORIENTAL FERM	1	
ORION HIGHWAY	71	25
OVERSEAS BOSTON	39	169
OVERSEAS CHICAGO	22	
OVERSEAS HARRIET	8	21
OVERSEAS JOYCE	57	66
OVERSEAS JUNEAU	4	169
OVERSEAS MARILYN	11	
OVERSEAS NEW YORK	24	
OVERSEAS OHIO	4	
PACASIA	15	28
PACBARON	34	
PACDUCHESS	62	58
PACDUKE	22	12
PACGLORY	9	41
PACIFIC ANGEL	2	
PACIFIC EMERALD	26	167
PACIFIC PRINCESS	118	
PACIFIC SONG	11	
PACKING	56	35
PACMERCHANT	67	36
PACNOBLE	24	
PACPRINCESS	66	
PACQUEEN	12	
PACSEA	18	
PACSTAR	20	
PACSUN	8	13
PACTRADER	6	
PAPAGO	74	1
PAPYRUS	43	105
PARIS SENATOR	39	
PATRIOT	92	48
PATRIOT STATE	28	62
PAUL BUCK	66	104
PAUL H. TOWNSEND	4	
PAUL R. TREGURTHA	14	18
PECOS	15	19
PEGGY DOW	121	
PELANDER	38	53
PENNSYLVANIA TRADER	46	
PERMEKE	72	81
PETROBULK PROGRESS	47	127
PETTY OFFICER USN	3	
PFC EUGENE A. OBREGON		9
PFC JAMES ANDERSON JR	10	
PFC WILLIAM B. BAUGH	7	7
PHAROS	65	
PHILIP R. CLARKE	3	4
PINE FOREST	14	107
POLAR ALASKA	31	113
POLYDEFKIS_P.	119	113
POLYNESIA	48	86
POMEROL	22	20
PONCE	17	
POTOMAC TRADER	19	33
PRESIDENT ADAMS	98	118
PRESIDENT ARTHUR	17	93
PRESIDENT BUCHANAN	30	36
PRESIDENT EISENHOWER	192	105
PRESIDENT F. ROOSEVELT	48	227
PRESIDENT GARFIELD	12	
PRESIDENT GRANT	25	85
PRESIDENT HARDING	55	15
PRESIDENT HARRISON	58	
PRESIDENT HOOVER	31	80
PRESIDENT JACKSON	129	153
PRESIDENT JEFFERSON	1	31
PRESIDENT KENNEDY	61	141
PRESIDENT LINCOLN	164	214
PRESIDENT MADISON	19	141
PRESIDENT MONROE	148	120
PRESIDENT PIERCE	45	104
PRESIDENT POLK	118	152
PRESIDENT TRUMAN	106	151
PRESIDENT TYLER	70	129
PRESIDENT WASHINGTON	221	185
PRINCE OF OCEAN	101	155
PRINCE OF TOKYO	87	121
PRINCE OF TOKYO 2	98	138
PRINCE WILLIAM SOUND	38	110
PRINSENGRACHT	75	
PROSPERO	35	45
PUERTO CORTES	3	
PURITAN	20	
PVT FRANKLIN J. PHILLI	14	
QUEEN ELIZABETH 2	102	
QUEENSLAND STAR	141	
RAINBOW BRIDGE	125	17
RAINBOW HOPE	5	210
RALEIGH BAY	47	114
RANA M	33	12
RANGER	61	28
RECIFE	126	
REFORM	22	
RESOLUTE	54	131
RICHARD G MATTIESEN	86	15
RIO FRIO	45	
RISING STAR	31	117
RIVERHEAD SPIRIT, USA	39	29
ROBERT E. LEE	21	28
ROGER BLOUGH	14	38
ROSEBANK	155	
ROSETTA	66	171
ROSINA TOPIC	13	39
ROTTERDAM	91	
ROVER	9	156
ROYAL PRINCESS	114	
RUBIN DOGA	53	
RUBIN OCEAN	30	
RUTH LYKES	37	23
S.T. CRAPO	16	
S.T.SEAL ISLAND,LIBERI		18
SALINAS	28	143
SAM HOUSTON	16	16
SAMU	11	27
SAMUEL L. COBB	17	
SAN MARTIN	27	
SAN NICOLAS	35	
SAN PEDRO	36	
SANKO PIONEER	5	
SANKO PRELUDE	17	31
SANSINENA II	138	16
SANTA BARBARA	42	
SANTA MONICA	63	
SANTOS	45	
SAPAI	8	30
SATURN DIAMOND	42	
SAVANNAH	99	
SCAN	48	84
SCARAB	118	42
SCHACKENBORG	22	34
SEA BELLS	46	195
SEA COMMERCE	63	
SEA FAN	54	122
SEA FORTUNE	41	134
SEA FOX	20	20
SEA LIGHT	37	49
SEA LION	197	
SEA MERCHANT	428	140
SEA TRADE	13	
SEA WOLF	213	122
SEALAND ACHIEVER	237	102
SEALAND ANCHORAGE	37	134
SEALAND ATLANTIC	51	80
SEALAND CHALLENGER	73	
SEALAND CONSUMER	66	187
SEALAND CRUSADER	63	30
SEALAND DEFENDER	159	141
SEALAND DISCOVERY	24	15
SEALAND ENDURANCE	59	26
SEALAND ENTERPRISE	204	221
SEALAND EXPEDITION	8	
SEALAND EXPLORER	104	167
SEALAND EXPRESS	81	207

	RADIO	MAIL
SEALAND FREEDOM	5	
SEALAND HAWAII	90	216
SEALAND INNOVATOR	120	153
SEALAND INTEGRITY	62	86
SEALAND KODIAK	30	70
SEALAND LIBERATOR	71	65
SEALAND MARINER	52	77
SEALAND NAVIGATOR	179	237
SEALAND PACIFIC	113	185
SEALAND PATRIOT	70	59
SEALAND PERFORMANCE	108	58
SEALAND PRODUCER	48	157
SEALAND QUALITY	26	165
SEALAND RELIANCE	94	149
SEALAND SPIRIT	93	182
SEALAND TACOMA	35	101
SEALAND TRADER	198	175
SEALAND VALUE	68	103
SEALAND VOYAGER	99	142
SEDCO/BP 471	222	176
SEMINOLE	10	3
SENATOR	32	
SGT WILLIAM A BUTTON	7	
SGT. METEJ KOCAK	40	53
SHELDON LYKES	61	134
SHELLY BAY	1	43
SHIRAOI MARU	102	40
SHOSHONE SPIRIT	18	
SIERRA MADRE	29	53
SITHEA	26	10
SKANDERBORG	74	55
SKAUBRYN	157	
SKAUGRAN	132	53
SKODSBORG	26	37
SOLAR WING	76	160
SONBAI	1	
SONORA	61	49
SOUTHLAND STAR	152	
SPIRIT OF TEXAS, USA	23	109
SPRING BEAR	137	
STAR EAGLE	65	138
STAR EVVIVA	25	
STAR FLORIDA	43	
STAR FRASER	62	
STAR GEIRANGER	19	7
STAR GRAN	11	121
STAR GRINDANGER	9	12
STAR HONG KONG	136	
STAR LIVORNO	38	
STAR MARLINN	24	
STAR MERCHANT	2	151
STAR MINERVA	8	45
STAR OF TEXAS	3	
STAR STRONEN	12	
STAR WILMINGTON	6	18
STELLA LYKES	32	34
STELLAR VENUS	26	
STEWART J. CORT	26	34
STONEWALL JACKSON	13	42
STRIDER ISIS	97	122
STUTTGART EXPRESS	254	
SUE LYKES	9	26
SUGAR ISLANDER	8	52
SUNBELT DIXIE	29	85
SUNRISE RUBY	5	23
SWIFTNES	14	
TABASCO	72	108
TAI CHUNG	37	29
TAI HE	121	
TAI SHAN	79	
TAI SHING	18	1
TAMPA	14	
TAMPA BAY	76	79
TARKWA,NORWAY		21
TERNOZA	4	
TEXACO WESTCHESTER	39	
TEXAS TRADER	7	
THOMAS WASHINGTON	82	84
TILLIE LYKES	55	53
TOBA	1	
TOHZAN	30	
TOLUCA	51	49
TONCI TOPIC	9	58
TONSINA	59	116
TOWER BRIDGE	143	
TRANSWORLD BRIDGE	84	83
TSL BRAVO	62	
TULSIDAS	9	
TYSON LYKES	40	97
UCHOA	126	250
ULTRAMAR	31	39
ULTRASEA	11	40
UNAMONTE	32	10
UNIVERSE	11	
URTE	179	90
USCGC ACACIA (WLB406)	1	
USCGC ACTIVE WMEC 618	16	
USCGC ACUSHNET WMEC 16	17	
USCGC ALERT (WMEC 630)	23	
USCGC BEAR (WEMC 901)	53	
USCGC BOUTWELL WHEC 71	88	
USCGC BRAMBLE (WLB 392	5	
USCGC CAMPBELL	16	
USCGC CHASE (WHEC 718)	6	
USCGC CITRUS (WMEC 300	6	
USCGC COURAGEOUS	25	49
USCGC DEPENDABLE	21	
USCGC DURABLE (WMEC 62	6	
USCGC ESCAPE (WMEC 6)	32	46
USCGC FIREBUSH WLB 393	11	
USCGC FORWARD	71	127
USCGC GALLATIN	10	
USCGC HAMILTON WHEC 71	4	13
USCGC HARRIET LANE	34	
USCGC IRONWOOD (WLB 29	13	5
USCGC JARVIS (WHEC 725	24	
USCGC KATMAI BAY	1	
USCGC MACKINAW	81	126
USCGC MALLOW (WLB 396)	69	
USCGC MARIPOSA	4	
USCGC MATINICUS	3	
USCGC MELLON (WHEC 717	133	115
USCGC MOHAWK WMEC 913	35	47
USCGC MUNRO	82	
USCGC NEAH BAY	11	2
USCGC NORTHLAND WMEC 9	67	49
USCGC PLANETREE	54	61
USCGC POLAR SEA__(WAGB	377	216
USCGC RELIANCE WMEC 61	48	23
USCGC RUSH	93	
USCGC SEDGE (WLB 402)	5	6
USCGC SENECA	59	
USCGC SPENCER	4	
USCGC STEADFAST WMEC 6	53	
USCGC STORIS (WMEC 38)	39	
USCGC SUNDEW (WLB 404)	4	16
USCGC SWEETBRIER WLB 4	42	
USCGC TAHOMA	19	
USCGC TAMAROA (WMEC 16	65	
USCGC TAMPA WMEC 902	3	3
USCGC THETIS		48
USCGC VENTUROUS WMEC 6	7	
USCGC VIGILANT WMEC 61	1	
USCGC WOODRUSH (WLB 40	44	
USCGC YOCONA (WMEC 168	2	7
USNS ASSURANCE AGOS-5	33	
USNS BOLD	15	
USNS CAPELLA	9	
USNS CHAUVENET TAGS 29	88	
USNS DE STEIGUER	68	46
USNS DENEBOLA	3	
USNS GUS W. DARNELL	6	
USNS INVINCIBLE	3	
USNS JOHN MCDONNELL (T	119	126
USNS LITTLEHALES (T-AG	15	32
USNS MERCURY	18	21
USNS MOHAWK (T-ATF 170	52	
USNS NAVAJO_(TATF-169)	17	28
USNS PECOS	1	
USNS POWHATAN TATF 166	35	37
USNS RANGE SENTINEL		19
USNS REDSTONE	14	
USNS REGULUS	18	40
USNS RIGEL (T-AF 58)		74
USNS SATURN T-AFS-10		40
USNS SEALIFT ANTARCTIC	1	
USNS SEALIFT ARCTIC	56	41
USNS SEALIFT ATLANTIC	13	
USNS SEALIFT CARIBBEAN	37	
USNS SEALIFT CHINA SEA	15	
USNS SEALIFT INDIAN OC	11	
USNS SEALIFT MEDITERRA	6	
USNS SILAS BENT T-AGS	4	
USNS SIOUX	10	
USNS SPICA (T-AFS 9)		17
USNS VANGUARD TAG 194	99	
USNS VICTORIOUS	75	
USNS WILKES T-AGS-33	51	
VALIANT	18	2
VAN TRADER	51	58
VERA ACORDE	23	115
VIKING ACE	61	
VINE	62	
WASHINGTON HIGHWAY	144	
WASHINGTON RAINBOW #2	22	102
WECOMA	172	177
WELLINGTON STAR	164	
WEST MOOR	121	
WESTERN FUTURE	8	6
WESTERN FUTURE, PHILIP		43
WESTWARD		71
WESTWARD VENTURE	25	140
WESTWOOD ANETTE	64	71
WESTWOOD BELINDA	36	40
WESTWOOD CLEO	127	106
WESTWOOD JAGO	77	99
WESTWOOD MARIANNE	8	153
WHITING SEA	33	
WILFRED SYKES	14	
WILLIAM E. MUSSMAN	9	85
WORLD WING #2	55	
YACU WAYO	6	
YANKEE CLIPPER	95	
YOUNG SPROUT, PORT VIL	33	78
ZETLAND	149	
ZIM AMERICA	49	
ZIM CALIFORNIA	22	
ZIM CANADA	51	
ZIM HONGKONG	13	
ZIM HOUSTON	54	
ZIM IBERIA	29	
ZIM KEELUNG	21	
ZIM KINGSTON III	304	
ZIM MARSEILLES	24	
ZIM MIAMI	66	
ZIM SAVANNAH	39	

SUMMARY: GRAND TOTAL VIA RADIO 48419

GRAND TOTAL VIA MAIL 40950

TOTAL UNIQUE OBS 72529

TOTAL DUPLICATES 16840 (23.2%)

UNIQUE RADIO OBS.31579 (43.5%)

UNIQUE MAIL OBS. 24110 (33.2%)

January, February, and March 1992

CALL SIGN	TOTAL	BATHY	TESAC	SHIP NAME
AKANG	11	11	0	***
APLJH	3	3	0	***
A8VI	31	31	0	PACDUCHESS
BOAB	56	56	0	TAI HE
CGDV	243	243	0	W. TEMPLEMAN
CGZP	1	1	0	NIPICON
CG2676	39	39	0	SHAMOOK
CG2683	60	60	0	ALFRED NEEDLER
CG2958	37	0	37	TULLY
CG2965	16	16	0	RICKER
C6HL8	87	87	0	COLUMBIA STAR
C6IO	53	53	0	***
C6JY6	98	98	0	MELBOURNE STAR
C6JZ2	65	65	0	AMERICAN STAR
C6JZ3	37	37	0	QUEENSLAND STAR
DAKE	139	99	40	KOELN ATLANTIC
DA9100	182	182	0	PLATFORM NORDSEE
DBLK	22	22	0	POLAR STERN
DD8436	22	22	0	***
DGLM	95	95	0	MONTE ROSA
DGVK	86	86	0	COLUMBUS VICTORIA
DGZV	81	81	0	COLUMBUS VIRGINIA
DHCW	25	25	0	COLUMBUS WELLINGTON
DHOU	10	10	0	PURITAN
DIDA	38	38	0	ARIANA
DLEZ	37	37	0	YANKEE CLIPPER
D5BC	76	76	0	SEDCO/BP471
D5ND	1	1	0	SAINT LUCIA
D5NE	52	52	0	MT. CABRITE
D5NZ	38	38	0	POLYNESIA
EFEL	2	2	0	***
ELAX5	6	6	0	COPIAPO
ELBX3	37	37	0	PACKING
ELED8	23	23	0	PACPRINCESS
ELEH6	11	11	0	***
ELHL6	99	99	0	COLUMBUS OHIO
ELIL9	39	39	0	NAVIGATOR
ELIS	76	76	0	MARINER
EREI	19	1	18	OKEAN
ERET	19	14	5	GEORGE OUSHAKOV
EWBK	39	39	0	ODESSA
FADV	4	4	0	BALNY
FITA	158	158	0	NOROIT
FNCZ	88	88	0	DELMAS SURCOUF
FNED	59	59	0	UTRILLO
FNGB	15	15	0	MARION DUFRESNE
FNGS	87	87	0	LA FAYETTE
FNIB	84	84	0	THALASSA
FNJT	4	4	0	KORRIGAN
FNOM	2	2	0	RENOIR
FNQB	77	77	0	ILE MAURICE
FNQD	27	27	0	ILE EDLA REUION
FNQM	10	10	0	SUZANNE DELMAS
FNXW	11	11	0	SAINT ROCH
FNZB	22	22	0	SAINT ROLAND
FNZO	83	83	0	RABELAIS
FNZP	59	59	0	RACINE
FNZQ	4	4	0	RIMBAUD
FPMN	1	1	0	***
FPYO	20	20	0	CAP SAINT PAUL
GACA	142	142	0	CUMULUS
GDLS	45	45	0	DARWIN
GPHH	1	1	0	FARNELLA
GQEK	72	72	0	FORTHBANK
GYRW	40	40	0	ENCOUNTER BAY
GYSA	65	65	0	FLINDERS BAY
GYSE	43	43	0	NEDLLOYD TASMAN
HPAN	17	17	0	MICRONESIAN COMMERCE
HPEW	107	107	0	PACIFIC ISLANDER
H8CB	7	7	0	TILLY
H9BQ	47	47	0	MICRONESIAN INDEPENDENCE
JBOA	41	41	0	KEIFU MARU
JCCX	65	65	0	CHOFU MARU
JCDF	32	32	0	SOYO MARU
JCOD	9	9	0	SHOYO
JDRD	80	80	0	SHOYO MARU
JDWX	76	76	0	KOFU MARU
JFDG	67	67	0	SHUMPU MARU
JFM6	1	1	0	***
JFPQ	38	38	0	KASHIMASAN MARU
JGBB	47	47	0	***
JGZK	132	132	0	RYOFU MARU
JITV	58	58	0	WELLINGTON MARU
JNZL	290	290	0	KAIYO MARU
JPVB	55	55	0	SEIFU MARU
JRBM	35	35	0	OGASAWARA MARU
JSVY	4	4	0	SHIRASE
J8FO	78	78	0	ROSEBANK
KGJB	36	36	0	SEALAND DEFENDER
KGWU	4	4	0	TH. WASHINGTON
KIRH	65	65	0	SEALAND TRADER
KNFQ	55	55	0	SEA WOLF
KRGB	109	109	0	SEALAND ENTERPRISE
LADB2	62	62	0	SKAUGRAN
LAJV4	87	87	0	SKAUBRYN
NATM	1	1	0	ANTIETAM
NAVOCE	156	156	0	U.S. NAVAL OCEANOGRAPHIC
NELP	1	1	0	JSEPH HEWES
NGDF	23	23	0	MUNRO
NHDB	1	1	0	TRUETT
NHTE	1	1	0	ELROD
NHTM	18	18	0	***
NHUE	1	1	0	***
NICB	6	6	0	***
NJHF	1	1	0	FLATLEY
NLXZ	1	1	0	ENGLAND
NMEL	67	67	0	MELLON
NRGB	1	1	0	ROBERT G. BRADLEY
NRLC	1	1	0	CONOLLY
NRP	3	3	0	***
NRUQ	136	136	0	POLAR SEA
NZOC	1	1	0	MAHAN
OACA	1	1	0	***
OWUO6	61	61	0	MOANA PACIFIC COBENHAVN
PGDI	38	38	0	NEDLLOYD MANILA
PGDY	64	64	0	NEDLLOYD MADRAS
PGEC	1	1	0	NEDLLOYD VAN NOORT
PGFE	13	13	0	NEDLLOYD VAN DIEMEN
PJJU	70	70	0	OLEANDER
RV0	75	75	0	***
RV1	83	83	0	***
RV2	65	65	0	***
RV3	2	2	0	***
RV6	391	391	0	***
SCPK	1	1	0	TV 260
SCRIPP	1	1	0	SCRIPPS INST.
SEPI	14	0	14	ARGOS
SEXN	5	5	0	TV 227
SEXQ	1	1	0	TV 278
SEYD	4	4	0	TV 274
SEYX	1	1	0	***
SHIP	703	701	2	***
SHPF	1	1	0	TV 281
SJIB	1	1	0	TV 282
SKVP	6	6	0	TV 284
SLDN	1	1	0	TV 10
SMZJ	2	2	0	TV 105
SMZQ	2	2	0	TV 102
S6FK	92	92	0	SWAN REEFER
TFEA	37	37	0	BJARNI SAEMUNDSSON
TWR3	5	5	0	***
UINF	13	12	1	VLADIMIR PARSHIN
UJFO	12	12	0	MULTANOVSKIY PROF
UVMJ	2	2	0	VSEVOLOD BERYOZKIN
UZFA	1	0	1	***
VC9450	179	179	0	GADUS ATLANTICA
VJBQ	32	32	0	ANRO AUSTRALIA
VJDP	77	77	0	IRON PACIFIC
VKCN	43	43	0	CANBERRA
VKCV	20	20	0	DERWENT
VKDA	6	6	0	DARWIN
VKLA	20	20	0	ADELAIDE
VKLB	5	5	0	HOBART
VKLC	10	10	0	BRISBANE
VKPM	12	12	0	MORESBY
VKPT	52	52	0	PERTH
VLNB	58	58	0	TORRENS
VXNB	24	24	0	AIRCRAFT
V2PM	126	126	0	WESTMOOR
WCGN	22	22	0	CHEVRON CALIFORNIA
WLDZ	5	5	0	MAURICE EWING
WPGK	77	77	0	SEALAND NAVIGATOR
WPKD	107	107	0	SEALAND ACHIEVER
WRBA	4	4	0	PACMISRANFAC HAWAREA
WRBB	6	6	0	***
WSRL	26	26	0	SEALAND PACIFIC
WTDF	5	5	0	TOWNSEND CROWWELL
WTDM	25	25	0	MILLER FREEMAN
WTDO	70	63	7	OREGON II
WTEA	25	9	16	DISCOVERER
WTEC	17	17	0	JOHN V.VICKERS
WTEG	7	7	0	MT. MITCHELL
WTER	52	0	52	MALCOLM BALDRIGE
WTES	93	89	4	SURVEYOR
WTEW	2	2	0	WHITING
WUS9293	59	59	0	MOANA WAVE
WXBR	59	59	0	CHEVRON MISSISSIPPI
YDLR	71	71	0	BOGASARI LIMA
Y3CH	1	0	1	PROF. ALBRECHT PENCK
Y3CW	7	0	7	A. V. HUMBOLT
ZCKP	14	14	0	STAR HONG KONG
ZDAZ	63	63	0	***
ZDBE9	121	121	0	VOYAGER
ZMCR	11	11	0	CANTERBURY
3DTF	54	54	0	SOUTHLAND STAR
3EAW7	2	2	0	ANDINO
3EET4	50	50	0	SEAS EIFFEL
7JDU	107	107	0	NATSUSHIMA
7JOB	21	21	0	CALIFORNIA CERES
7JWN	38	38	0	TAKUYO
7KDD	9	9	0	YOKO MARU
9VBZ	40	40	0	MAHSURI
9VUU	50	50	0	ANRO ASIA
9VVB	76	76	0	GOLDENSARI IMDAH
9VWM	17	17	0	MANDAMA
21002	556	556	0	BUOY
21004	693	693	0	BUOY
22001	709	709	0	BUOY
22002	1	1	0	BUOY
22004	1	1	0	BUOY
32019	1	1	0	BUOY
32310	1	1	0	BUOY
32315	96	96	0	BUOY
32316	38	38	0	BUOY
32317	14	14	0	BUOY
32318	18	18	0	BUOY
32319	11	11	0	BUOY
43001	10	10	0	BUOY
51005	1	1	0	BUOY
51006	21	21	0	BUOY
51007	42	42	0	BUOY
51008	55	55	0	BUOY
51009	52	52	0	BUOY
51010	86	86	0	BUOY
51011	8	8	0	BUOY
51014	4	4	0	BUOY
51015	15	15	0	BUOY
51016	9	9	0	BUOY
51017	38	38	0	BUOY
51018	47	47	0	BUOY
51019	17	17	0	BUOY
51020	8	8	0	BUOY
51021	102	102	0	BUOY
51022	10	10	0	BUOY
51023	11	11	0	BUOY
51302	9	9	0	BUOY
52001	40	40	0	BUOY
52002	10	10	0	BUOY
52003	48	48	0	BUOY
52004	19	19	0	BUOY
52006	43	43	0	BUOY
52007	42	42	0	BUOY
52008	1	1	0	BUOY
52010	118	118	0	BUOY
52011	3	3	0	BUOY
52012	11	11	0	BUOY
52302	1	1	0	BUOY
52303	1	1	0	BUOY

TOTAL BATHYS	RECEIVED	12109	
TOTAL TESACS	RECEIVED	205	
TOTAL REPORTS	RECEIVED	12314	

January, February, and March 1992

Wave observations are taken each hour during a 20–minute averaging period, with a sample taken every 0.67 seconds. The significant wave height is defined as the average height of the highest one–third of the waves during the average period each hour. The maximum significant wave height is the highest of those values for that month. At most stations, air temperature, water temperature, wind speed and direction are sampled once per second during an 8.0–minute averaging period each hour (moored buoys) and a 2.0–minute averaging period for fixed stations (C–MAN). Contact NDBC Data Systems Division, Bldg 1100, SSC, Mississippi 39529 or phone (601) 688–2838 for more details.

JANUARY 1992

BUOY	LAT	LONG	OBS	MEAN AIR TP (C)	MEAN SEA TP (C)	MEAN SIG WAVE HT (M)	MAX SIG WAVE HT (M)	MAX SIG WAVE HT (DA/HR)	SCALAR MEAN WIND SPEED (KNOTS)	PREV WIND (DIR)	MAX WIND (KTS)	MAX WIND (DA/HR)	MEAN PRESS (MB)
41001	34.9N	073.0W	0740	16.0	20.4	2.4	5.4	09/06	16.5	NW	50.7	20/15	1019.1
41002	32.3N	075.2W	0744	19.9	23.4	2.1	5.3	20/16	13.9	W	35.5	20/09	1019.3
41006	29.3N	077.4W	0744	21.6	23.7	1.8	3.3	20/08	12.0	S	31.1	20/09	1020.5
41008	30.7N	081.1W	0743	14.2	15.8	1.1	2.7	11/10	10.7	N	24.3	24/22	1020.8
41009	28.5N	080.2W	1486	20.7	22.8	1.2	2.8	11/09	11.1	S	30.9	20/07	1019.8
41010	28.9N	078.5W	1485	21.7	23.8	1.6	3.5	20/07	11.9	S	33.8	20/09	1020.1
42001	25.9N	089.7W	0743	21.3	22.9	1.3	3.0	31/22	13.1	E	23.5	31/14	1018.3
42002	25.9N	093.6W	0741	21.0	22.8	1.4	3.2	31/13	13.8	NE	27.6	15/07	1017.3
42003	25.9N	085.9W	0742	22.7	24.6	1.2	2.7	16/03	14.0	E	24.7	30/16	1019.3
42007	30.1N	088.8W	0744		15.8				13.2	NE	31.9	19/05	1020.1
42019	27.9N	095.0W	0744	17.4	21.3	1.5	4.5	15/05	13.9	NE	28.2	15/01	1018.7
42020	27.0N	096.5W	0743	17.8	21.1	1.5	3.0	21/07	13.4	N	25.1	31/01	1018.6
44001	38.4N	073.7W	0742	7.4	11.8	1.7	5.4	12/11	14.9	NW	31.1	09/08	1020.4
44004	38.5N	070.7W	0742	9.5	15.4	2.2	6.4	19/07	15.8	NW	36.5	12/14	1019.6
44005	42.7N	068.6W	0743	0.9	5.9	1.9	5.5	12/18	15.6	W	31.7	12/13	1018.6
44007	43.5N	070.1W	0744	-2.5	4.8	0.9	5.0	12/22	14.5	SW	32.3	19/04	1019.5
44008	40.5N	069.4W	0743	4.0	7.4	1.8	5.1	12/16	15.8	NW	37.5	19/08	1019.7
44009	38.5N	074.7W	0740	5.4	8.2	1.2	4.4	09/06					1020.7
44011	41.1N	066.6W	0683	3.5	5.1	1.7	5.7	17/11	13.3	NW	36.3	19/10	1018.2
44012	38.8N	074.6W	0743	4.7	7.2	1.1	3.8	12/00	15.4	NW	34.8	31/18	1020.6
44013	42.4N	070.8W	0742	-0.5	4.7	0.6	3.6	12/21	14.7	SW	36.5	31/22	1020.0
44014	36.6N	074.8W	0742	9.0	11.1	1.6	5.2	09/06	13.6	N	29.5	07/22	1020.4
44015	37.1N	073.6W	0631	11.5	16.8	1.8	5.9	12/08					1021.4
44023	37.5N	074.4W	0415	7.9	11.0	1.4	4.0	16/17	13.6	SW	27.8	21/15	1016.6
45002	45.3N	086.4W	0743	-5.7	3.9	1.2	5.6	23/04					1018.7
45004	47.5N	086.5W	0741	-2.7	3.0	1.5	4.7	23/00					1018.6
46001	56.3N	148.3W	0741	2.7	3.9	3.4	11.0	19/15	16.0	E	37.9	17/09	1012.3
46002	42.5N	130.4W	0743	10.5	11.2	2.8	7.3	13/19	12.5	SW	29.3	11/10	1021.5
46003	51.9N	155.9W	0743	4.1	4.5	3.9	16.9	19/04	17.6	E	43.7	19/00	1004.3
46005	46.1N	131.0W	0572	8.5	8.8	3.1	7.4	13/19	12.3	S	36.5	11/11	1019.5
46006	40.8N	137.7W	0272	13.0	12.9	2.9	7.2	11/04	17.1	SW	29.7	11/00	1012.6
46010	46.2N	124.2W	0743	6.6	7.1	2.2	5.2	12/09	13.4	E	34.6	11/16	1021.4
46011	34.9N	120.9W	0741	12.2	13.1	1.8	4.9	14/17	8.1	NW	23.5	16/04	1020.7
46012	37.4N	122.7W	0741	11.0	11.8	1.8	4.3	14/13	8.1	NW	25.2	16/03	1021.2
46013	38.2N	123.3W	0740	10.2	10.5	1.9	4.8	14/14	8.8	NW	26.1	16/01	1021.5
46014	39.2N	124.0W	0742	9.7	10.7	2.1	4.4	14/15	9.1	NW	27.6	28/23	1021.4
46023	34.3N	120.7W	0742	12.3	13.3	2.0	4.8	14/18	11.1	NW	28.3	16/04	1019.3
46025	33.8N	119.1W	0743	14.1	14.8	1.0	2.7	16/03	6.9	NW	27.4	16/16	1019.5
46026	37.8N	122.7W	0741	10.0	10.4	1.5	4.8	14/10	9.2	E	26.4	16/04	1021.4
46027	41.8N	124.4W	0736	8.5	8.8	2.1	5.4	14/07	10.7	N	30.3	24/02	1021.5
46028	35.8N	121.9W	0743	11.6		2.0	5.0	14/15	9.1	NW	29.9	16/03	1021.1
46035	57.0N	177.7W	0743	-1.9	2.1	3.9	10.8	24/06	22.1	NE	41.2	23/21	1008.5
46042	36.8N	122.4W	0744	11.0	12.1	2.0	4.6	14/16	8.3	N	24.9	16/05	1021.3
46045	33.8N	118.5W	0026	14.0	14.5	0.4	0.5	31/02	6.0	W	9.5	31/21	1022.8
51001	23.4N	162.3W	0742	22.4	23.9	2.8	7.3	28/04	10.7	E	30.7	28/00	1015.9
51002	17.2N	157.8W	0382	24.2		2.3	4.6	29/08	11.6	NE	20.8	17/12	1013.6
51003	19.2N	160.8W	0742	24.0	25.1	2.4	4.7	28/18	9.8	W	22.4	28/00	1014.5
ALSN6	40.5N	073.8W	0730	2.1	6.2	0.9	4.1	12/05	15.8	NW	38.9	31/17	1021.1
BURL1	28.9N	089.4W	0743	12.3					15.1	NE	31.8	30/01	1018.9
BUSL1	27.9N	090.9W	0467	17.8	22.7				16.4	N	33.6	18/16	1018.0
BUZM3	41.4N	071.0W	0743	1.5		1.2	2.8	12/15	16.2	W	36.9	19/04	1021.1
CARO3	43.3N	124.4W	0744	7.6					11.8	S	34.9	12/00	1022.1
CHLV2	36.9N	075.7W	0741	7.1	8.5	1.1	3.7	07/19	15.7	N	35.3	09/03	1021.2
CLKN7	34.6N	076.5W	0744	9.9					11.2	N	24.0	01/03	1021.5
CSBF1	29.7N	085.4W	0743	13.7					6.3	NE	31.6	15/21	1020.6
DBLN6	42.5N	079.4W	0737	-2.5					14.8	SW	46.1	18/19	1019.7
DESW1	47.7N	124.5W	0743	5.6					11.3	SE	41.7	11/14	1021.3
DISW3	47.1N	090.7W	0741	-9.5					14.4	W	33.9	18/06	1019.0
DPIA1	30.3N	088.1W	0744	12.1	13.6				12.1	N	31.4	19/10	1021.1
DSLN7	35.2N	075.3W	0739	12.1	17.6	1.7	4.4	08/14	17.9	N	45.3	12/03	1020.8
ENIP2	11.4N	162.4E	0742	26.9					16.7	E	26.2	18/11	1009.7
FBIS1	32.7N	079.9W	0744	10.6					8.4	NE	23.9	01/05	1021.7
FFIA2	57.3N	133.6W	0743	0.1					13.8	N	31.4	25/05	1019.1
FPSN7	33.5N	077.6W	0744	13.7					16.3	N	38.6	11/19	1021.3
GBCL1	27.8N	093.1W	0743	17.6	22.1	0.9	2.3	15/09	15.7	NE	35.4	15/04	1019.0
GDIL1	29.3N	090.0W	0744	12.8	14.7				12.1	NE	28.6	19/05	1019.8
GLLN6	43.9N	076.5W	0739	-3.7					16.0	W	41.2	18/19	1019.6
IOSN3	43.0N	070.6W	0708	-1.7					15.8	W	39.9	31/18	1020.2
KOSP2	5.4N	163.0E	0740	27.5					10.1	NE	23.4	07/15	1008.2
LKWF1	26.6N	080.0W	0739	22.0	23.9				11.1	E	27.8	10/18	1019.8
MDRM1	44.0N	068.1W	0742	-2.4					18.0	NW	40.0	19/03	1018.1
MISM1	43.8N	068.9W	0492	-1.8					18.9	W	45.4	19/07	1013.0
MLIP2	6.1N	172.6E	0742	27.6					10.9	NW	26.9	20/20	1007.7

MEAN	MEAN	MEAN SIG	MAX SIG	MAX SIG	SCALAR MEAN	PREV	MAX	MAX	MEAN

BUOY	LAT	LONG	OBS	MEAN AIR TP (C)	MEAN SEA TP (C)	MEAN SIG WAVE HT (M)	MAX SIG WAVE HT (M)	MAX SIG WAVE HT (DA/HR)	SCALAR MEAN WIND SPEED (KNOTS)	PREV WIND (DIR)	MAX WIND (KTS)	MAX WIND (DA/HR)	MEAN PRESS (MB)
MLRF1	25.0N	080.4W	0737	23.7	24.9				13.1	SE	26.0	16/10	1019.2
MPCL1	29.4N	088.6W	0733	15.3	18.1	0.9	2.2	19/06	14.2	NE	32.6	15/15	1019.5
NWPO3	44.6N	124.1W	0744	6.5					10.3	E	35.0	11/22	1021.3
PAGP2	18.1N	145.8E	0743	24.7					7.2	NE	16.6	26/23	
PILM4	48.2N	088.4W	0737	-11.2					16.5	NW	36.1	18/05	1017.8
PTAC1	39.0N	123.7W	0743	8.6					7.1	N	24.1	30/21	1021.8
PTAT2	27.8N	097.1W	0744	11.8	12.8				11.3	N	27.2	21/00	1019.2
PTGC1	34.6N	120.7W	0742	12.1					10.3	N	34.3	16/03	1020.0
ROAM4	47.9N	089.3W	0640	-10.5	4.8				15.5	W	37.1	22/18	1019.8
SANF1	24.5N	081.9W	0468	23.1					11.6	SE	21.3	16/08	1017.9
SAUF1	29.9N	081.3W	0740	15.0	15.9				10.5	N	30.3	24/22	1020.4
SBIO1	41.6N	082.8W	0739	-2.8					14.1	SW	35.6	24/00	1020.6
SGNW3	43.8N	087.7W	0739	-7.5					13.3	W	33.1	22/22	1020.1
SISW1	48.3N	122.9W	0743	4.7					7.8	SE	34.0	11/15	1022.6
SMKF1	24.6N	081.2W	0729	23.7	24.6								1019.4
SPGF1	26.7N	079.0W	0739	22.6	24.6				8.8	E	22.1	26/08	1019.7
SRST2	29.7N	094.1W	0744	10.5					10.0	NE	29.5	15/05	1021.2
STDM4	47.2N	087.2W	0739	-7.7					20.2	W	42.0	22/20	1017.3
SVLS1	32.0N	080.7W	0743	11.4		8.9	2.4	01/11	13.3	NE	29.5	13/06	1022.1
FEBRUARY		**1992**											
32302	18.0S	085.1W	0679	22.7	23.3	1.8	2.7	22/16	12.1	SE	20.2	21/07	1014.9
41001	34.9N	073.0W	0688	15.4	20.1	2.6	5.8	29/23	16.4	NW	34.2	02/01	1014.9
41006	29.3N	077.4W	0689	20.5	22.3	2.0	5.0	07/10	13.7	S	30.7	07/09	1016.7
41008	30.7N	081.1W	0689	13.3	13.3	1.0	2.8	06/16	9.2	N	26.2	06/16	1017.1
41009	28.5N	080.2W	1376	18.8	21.5	1.3	3.1	07/14	11.3	W	24.5	08/04	1017.5
42001	25.9N	089.7W	0688	20.3	21.4	1.2	5.6	05/23	12.2	NW	33.2	05/17	1016.1
42002	25.9N	093.6W	0689	20.4	22.4	1.4	5.6	05/14	14.4	SE	38.7	05/11	1016.1
42003	25.9N	085.9W	0688	21.1	22.8	1.3	5.7	06/03	12.2	NE	35.0	06/00	1017.0
42007	30.1N	088.8W	0581	14.5	15.4				11.2	E	29.1	04/22	
42019	27.9N	095.0W	0691	18.2	20.0	1.2	4.4	05/13	12.9	SE	33.2	05/12	1015.9
42020	27.0N	096.5W	0689	18.2	19.5	1.0	3.8	05/11	11.1	SE	32.1	05/09	1016.0
42025	24.9N	080.4W	0688	22.2	23.6	0.6	2.2	05/19					
44004	38.5N	070.7W	0687	9.0	15.1	2.6	6.6	02/12	18.6	NW	33.8	08/00	1013.7
44005	42.6N	068.6W	0607	0.6	3.9	2.0	5.9	02/05	16.5	NW	33.8	02/11	1013.8
44008	40.5N	069.4W	0669	2.8	5.3	2.2	5.6	02/15	18.1	N	37.7	05/12	1013.0
44009	38.5N	074.7W	0689	4.2	5.0	1.2	3.1	08/14	15.1	N	34.6	02/02	1016.1
44011	41.1N	066.6W	0439	1.4	4.1	3.0	6.5	02/22	17.8	NW	35.9	05/19	1012.1
44012	38.8N	074.6W	0672	3.5	4.2	1.1	3.1	08/12	14.8	NW	32.8	02/00	1016.0
44013	42.4N	070.8W	0688	-0.3	2.9	0.9	3.2	02/01	15.6	NW	34.2	05/15	1013.6
44014	36.6N	074.8W	0688	7.7	8.6	1.7	4.5	07/14	13.1	NW	31.3	29/19	1015.6
44025	40.3N	073.2W	0682	2.9	4.0	1.1	3.1	08/10	14.1	NW	29.5	02/04	1015.4
45002	45.3N	086.4W	0688	-2.2	3.3	0.8	3.3	10/14					1016.9
46001	56.3N	148.3W	0686	1.8	4.0	2.8	7.4	24/04	15.8	N	37.1	24/04	1001.6
46002	42.5N	130.3W	0686	11.2	11.8	3.3	5.8	03/01	13.9	SE	25.1	28/02	1007.8
46003	51.9N	155.9W	0687	1.4	3.8	2.7	6.5	05/15					1007.3
46005	46.1N	131.0W	0688	9.2	9.9	3.2	6.9	21/23	13.9	S	34.0	02/19	1006.6
46012	37.4N	122.7W	0688	13.2	13.5	2.5	4.7	09/23	11.2	S	33.8	10/00	1015.5
46013	38.2N	123.3W	0688	12.9	13.4	2.6	4.5	09/23	10.9	SE	33.5	10/00	1015.1
46022	40.8N	124.5W	0686	11.5	12.0	2.7	5.1	11/06	12.1	S	32.1	10/22	1013.5
46023	34.3N	120.7W	0689	14.2	14.3	2.4	4.3	11/06	11.5	NW	29.5	10/00	1015.6
46025	33.8N	119.1W	0687	15.0	15.0	1.5	3.3	11/05	9.0	W	26.4	07/00	1015.8
46026	37.8N	122.7W	0680	12.7	12.8	2.1	4.2	10/02	11.2	SE	32.3	10/01	1015.3
46027	41.8N	124.4W	0624	11.5	11.4	2.6	4.9	03/21	11.7	SE	34.8	20/01	1013.0
46029	46.2N	124.2W	0689	10.4	10.6	2.6	7.9	01/01	11.9	E	29.0	21/14	1012.8
46035	57.0N	177.7W	0686	-0.3	2.7	3.5	10.2	04/13	18.0	N	35.8	03/07	1008.7
46040	44.8N	124.3W	0567	10.4		2.8	6.7	01/00					1010.3
46041	47.4N	124.5W	0679	9.2	9.8	2.4	9.9	01/00	10.8	SE	30.1	21/14	1011.9
46042	36.8N	122.4W	0686	13.0		2.5	5.0	11/14	11.4	S	33.2	09/23	1015.5
46045	33.8N	118.5W	0688	15.1	15.3	1.1	3.0	11/08	6.4	E	24.5	23/05	1016.0
46047	32.7N	119.6W	0686	15.0	15.3	2.3	4.1	11/05	13.6	NW	27.6	02/14	1015.8
46048	32.9N	117.9W	0687	15.4	15.7	1.3	3.1	07/02	8.8	NW	27.8	12/19	1015.9
46050	44.6N	124.5W	0681	10.8	10.8	2.7	6.1	01/00	6.4	S	15.0	26/04	1011.6
51001	23.4N	162.3W	0687	21.1	22.7	3.1	6.3	25/10	15.0	E	26.4	13/11	1015.4
51002	17.2N	157.8W	0688	23.7		2.5	4.2	04/06	12.6	E	30.3	14/07	1014.7
51003	19.3N	160.8W	0229	23.5	24.9	2.8	4.8	03/21	12.7	NE	24.5	12/09	1014.5
51004	17.4N	152.5W	0504	23.1	23.8	2.5	4.5	06/15	10.6	E	23.0	01/09	1014.1
52009	13.7N	144.7E	0555	26.2	26.1	1.7	3.8	26/12	13.6	NE	21.4	26/03	1014.0
91222	18.1N	145.8E	0548	24.7									
91251	11.4N	162.4E	0681	25.9					15.9	NE	26.4	17/23	1012.5
91343	7.6N	155.2E	0688	26.5					12.8	NE	23.5	15/20	1011.4
91355	5.4N	163.0E	0686	27.2					11.8	NE	23.3	16/18	1009.8
91377	6.1N	172.1E	0691	26.9					8.8	SE	16.9	24/13	1009.6
ALSN6	40.5N	073.8W	0690	2.1	4.1	0.9	2.6	08/21	16.9	N	37.0	29/13	1016.2
BURL1	28.9N	089.4W	0690	14.9					13.1	NE	33.1	05/03	1016.9
BUZM3	41.4N	071.0W	0688	0.6		1.1	2.9	16/18	16.7	NW	37.5	29/12	1017.3
CARO3	43.3N	124.4W	0685	11.1					9.1	S	36.9	20/10	1011.8
CHLV2	36.9N	075.7W	0689	6.6	5.9	1.1	2.8	07/13	15.9	NE	36.8	29/16	
CLKN7	34.6N	076.5W	0691	10.3					12.8	NE	33.8	06/13	1016.8
CSBF1	29.7N	085.4W	0688	14.4					6.8	E	25.0	26/15	1017.2
DBLN6	42.5N	079.4W	0691	-1.3					12.8	SW	37.1	21/09	1015.9
DESW1	47.7N	124.5W	0686	9.0									1012.4
DISW3	47.1N	090.7W	0689	-3.7					12.7	NW	30.0	20/23	1018.1
DPIA1	30.3N	088.1W	0690	14.2	14.8				9.9	NE	35.4	05/07	1016.4
DSLN7	35.2N	075.3W	0435	10.1		2.1	5.6	07/07	20.0	NE	40.8	16/05	1016.7
FBIS1	32.7N	079.9W	0689	11.3					9.3	SW	30.4	05/19	1016.8
FFIA2	57.3N	133.6W	0688	3.0					17.9	N	40.2	18/15	1007.4
FPSN7	33.5N	077.6W	0687	14.7	18.2				17.8	W	49.9	07/05	1016.1
FWYF1	25.6N	080.1W	0689	21.7	23.1				13.9	SE	39.6	06/11	1017.0
GBCL1	27.8N	093.1W	0689	18.1	20.8				15.3	SE	44.9	05/14	1016.3
GDIL1	29.3N	090.0W	0689	15.6	16.5				10.5	E	27.6	06/01	1016.5
GLLN6	43.9N	076.5W	0689	-3.7					13.1	N	31.0	27/17	1015.8
IOSN3	43.0N	070.6W	0590	-1.7					16.3	NW	36.9	29/22	1013.7
MDRM1	44.0N	068.1W	0690	-2.4					19.6	NW	43.0	02/09	1013.1
MISM1	43.8N	068.9W	0682	-2.1					18.8	N	41.4	02/12	1013.1
MLRF1	25.0N	080.4W	0689	21.9	23.4				12.7	SE	37.4	05/18	1016.3
MPCL1	29.4N	088.6W	0672	16.1	17.8	1.0	2.9	05/10	13.6	E	35.5	05/05	1017.1
NWPO3	44.6N	124.1W	0652	10.9					9.3	E	38.0	21/14	1011.9
PILM4	48.2N	088.4W	0687	-5.7					13.1	N	37.3	10/06	1017.5
PTAC1	39.0N	123.7W	0686	11.6					10.5	S	35.5	14/11	1014.9

BUOY	LAT	LONG	OBS	MEAN AIR TP (C)	MEAN SEA TP (C)	MEAN SIG WAVE HT (M)	MAX SIG WAVE HT (M)	MAX SIG WAVE HT (DA/HR)	SCALAR MEAN WIND SPEED (KNOTS)	PREV WIND (DIR)	MAX WIND (KTS)	MAX WIND (DA/HR)	MEAN PRESS (MB)
PTAT2	27.8N	097.1W	0691	15.8	15.7				9.2	E	27.9	24/22	1016.0
PTGC1	34.6N	120.7W	0681	14.4					10.2	N	31.1	02/01	1015.6
ROAM4	47.9N	089.3W	0689	-5.5	0.9								1018.2
SANF1	24.5N	081.9W	0688	21.9	22.9				11.9	SE	38.7	06/09	1016.4
SAUF1	29.9N	081.3W	0691	14.2	13.4				8.9	N	27.6	06/18	1016.8
SBIO1	41.6N	082.8W	0689	-0.6					11.8	SW	28.1	21/04	1017.0
SGNW3	43.8N	087.7W	0686	-1.3					11.2	NW	37.1	28/19	1017.1
SISW1	48.3N	122.9W	0688	7.7					8.9	SE	35.8	21/17	1014.2
SMKF1	24.6N	081.1W	0679	22.0	23.0				13.7	SE	42.5	05/17	1016.7
SPGF1	26.7N	079.0W	0689	21.2	23.9				8.2	SE	24.0	07/07	1016.7
SRST2	29.7N	094.1W	0690	13.6					9.9	E	20.8	22/14	1016.1
STDM4	47.2N	087.2W	0688	-4.1					14.6	N	36.0	04/11	
SVLS1	32.0N	080.7W	0559	10.5		0.9	2.7	06/06	15.1	NE	35.8	06/08	1016.8
TPLM2	38.9N	076.4W	0689	4.0	3.4				11.4	NW	36.4	16/22	1016.9
TTIW1	48.4N	124.7W	0688	8.3					17.7	NE	55.6	01/00	1012.4
VENF1	27.1N	082.5W	0690	17.3	17.9				9.1	NW	25.1	07/03	1017.1
WPOW1	47.7N	122.4W	0686	8.2					7.2	N	26.7	01/00	1013.1
MARCH		**1992**											
32302	18.0S	085.1W	0722	22.4	23.0	1.7	2.9	06/04	11.0	SE	22.2	21/12	1013.7
41001	34.9N	073.0W	0737	15.1	19.3	2.7	7.0	26/20	16.2	W	38.9	11/12	1015.0
41006	29.3N	077.4W	0739	20.4	22.7	2.0	4.3	21/04	13.5	W	34.6	26/09	1017.2
41008	30.7N	081.1W	0736	15.2	15.7	0.9	2.5	26/04	9.0	S	24.7	11/08	1017.5
41009	28.5N	080.2W	1472	19.7	21.7	1.2	3.0	26/03	11.1	NW	26.2	26/02	1017.9
41010	28.9N	078.5W	0493	20.6	23.0	2.1	3.6	26/08	14.1	S	36.1	26/07	1016.7
42001	25.9N	089.7W	0740	21.0	22.0	0.9	2.9	11/13	11.0	SE	23.7	11/09	1017.0
42002	25.9N	093.6W	0736	21.4	22.7	1.2	3.8	11/01	13.8	SE	28.4	10/15	1016.3
42003	25.9N	085.9W	0740	21.9	24.9	1.0	2.6	11/16	11.7	E	25.1	11/12	1017.8
42007	30.1N	088.8W	0311	16.7	18.0				11.3	SE	25.3	10/20	
42019	27.9N	095.0W	0738	19.1	20.1	1.1	3.5	10/16	11.9	SE	28.6	10/16	1015.9
42020	27.0N	096.5W	0741	19.2	19.3	1.2	3.7	10/17	11.3	SE	28.6	10/16	1015.4
42025	24.9N	080.4W	0738	22.4	24.0	0.6	2.0	05/10					
44004	38.5N	070.7W	0737	8.9	14.1	2.7	8.8	27/06	17.4	NW	36.5	27/03	1013.8
44005	42.6N	068.6W	0692	0.6	2.8	2.0	5.3	12/12	15.1	W	32.4	12/10	1014.5
44007	43.5N	070.1W	0296	1.3	2.7	1.5	5.1	27/16	13.2	S	36.3	27/12	1011.7
44008	40.5N	069.4W	0739	3.1	4.7	2.2	6.8	27/14	17.6	NW	37.9	12/03	1013.2
44009	38.5N	074.7W	0739	5.3	5.4	1.2	4.3	27/06	14.4	N	33.4	27/00	1015.0
44011	41.1N	066.6W	0344	2.1	2.9	3.0	6.8	27/21	15.5	W	34.4	20/04	1012.5
44012	38.8N	074.6W	0740	4.8	5.0	1.2	5.2	27/07	14.2	NW	34.6	11/21	1014.6
44013	42.4N	070.8W	0737	1.0	2.9	0.8	2.9	27/10	14.9	NW	34.8	27/10	1013.2
44014	36.6N	074.8W	0737	7.8	8.1	1.6	5.8	26/23	12.1	SW	35.8	07/13	1014.9
44025	40.3N	073.2W	0733	3.7	4.4	1.5	5.7	27/10	14.2	NW	31.1	12/01	1014.4
45002	45.3N	086.4W	0739	-1.0	2.6	0.7	3.5	16/22	10.4	S	28.6	27/03	1016.3
45007	42.8N	087.1W	0193	2.7	3.0	0.8	5.1	27/07	10.6	S	34.4	27/06	1017.2
46001	56.3N	148.3W	0738	2.5	4.0	3.0	7.6	19/07	15.2	SW	34.2	19/02	1006.5
46002	42.5N	130.3W	0735	10.9	11.8	2.5	4.9	14/11	11.4	N	26.6	14/09	1014.4
46003	51.9N	155.9W	0733	2.8	3.4	3.6	6.5	18/16	17.0	SW	33.8	18/12	1003.0
46005	46.1N	131.0W	0729	9.4	10.2	2.4	4.2	27/06	10.7	SE	23.3	29/08	1015.4
46011	34.9N	120.9W	0499	14.0	14.9	2.2	3.8	31/06	10.5	NW	24.9	31/06	1015.1
46012	37.4N	122.7W	0731	13.4	14.1	2.2	4.1	15/14	10.6	NW	25.3	30/14	1014.6
46013	38.2N	123.3W	0375	12.9	13.8	2.3	3.3	02/11	13.1	NW	28.9	01/08	1013.9
46022	40.8N	124.5W	0736	11.9	12.7	2.5	4.2	08/05	10.4	N	28.0	05/00	1013.9
46023	34.3N	120.7W	0737	14.1	14.8	2.3	4.1	15/16	12.5	NW	29.5	02/11	1014.2
46025	33.8N	119.1W	0739	14.6	15.6	1.3	2.7	02/17	7.2	W	25.3	02/10	1014.4
46026	37.8N	122.7W	0730	13.1	14.0	1.9	3.7	15/12	10.6	NW	28.0	05/10	1014.2
46027	41.8N	124.4W	0634	11.7	12.5	2.1	3.3	08/02	9.7	NW	31.7	08/01	1013.7
46029	46.2N	124.2W	0733	10.4	11.2	2.0	3.7	27/22	8.4	NW	21.8	27/10	1016.1
46035	57.0N	177.7W	0739	-2.6	2.2	3.2	7.6	06/16	20.5	NE	36.1	18/08	1005.9
46040	44.8N	124.3W	0048	11.1		1.9	2.6	31/15	13.3	N	20.8	31/23	1020.9
46041	47.4N	124.5W	0732	9.9	11.0	1.9	3.8	27/17	7.8	N	22.0	27/13	1015.7
46042	36.8N	122.4W	0733	13.3		2.3	3.8	28/03	11.1	NW	23.3	30/16	1014.6
46045	33.8N	118.5W	0209	14.3	15.8	1.2	1.8	01/03	7.0	SW	19.2	03/00	1012.3
46047	32.7N	119.6W	0254	14.5	16.0	2.2	3.7	03/12					1013.2
46048	32.9N	117.9W	0741	15.1	16.2	1.2	2.9	20/20	9.0	W	30.5	02/12	1014.6
46050	44.6N	124.5W	0733	11.0	11.5	2.1	3.9	28/00	9.9	N	26.4	04/13	1015.5
46051	34.5N	120.7W	0507	14.1	15.1	2.2	4.1	15/18	11.7	NW	27.0	20/12	1015.4
51001	23.4N	162.3W	0280	22.0	22.8	2.0	3.2	03/00	8.4	E	16.9	03/07	1018.4
51002	17.2N	157.8W	0739	23.6		2.6	3.8	09/16	17.2	E	24.6	23/13	1016.7
51003	19.3N	160.8W	0244	23.8	24.6	2.4	3.8	18/15	12.2	E	22.4	17/21	1017.1
51004	17.4N	152.5W	0742	22.7	23.7	2.5	3.7	09/16	15.6	E	22.9	19/15	1016.2
52009	13.7N	144.7E	0728	26.0	25.8	2.1	2.9	15/05	14.8	NE	21.4	01/22	1014.6
91222	18.1N	145.8E	0732	25.7									
91251	11.4N	162.4E	0734	25.9					17.5	NE	24.7	21/14	1013.4
91328	8.4N	149.4E	0401	27.0					13.0	NE	19.6	18/14	1011.9
91343	7.6N	155.2E	0733	27.0					13.9	NE	22.0	09/19	1011.9
91355	5.4N	163.0E	0732	27.5					12.4	NE	21.7	08/21	1010.3
91377	6.1N	172.1E	0739	27.2					9.3	NE	22.2	29/21	1010.3
ALSN6	40.5N	073.8W	0738	3.2	4.1	1.1	3.8	27/12	17.5	NW	42.7	11/23	1015.0
BURL1	28.9N	089.4W	0735	16.9					12.7	E	29.9	11/05	1017.7
BUZM3	41.4N	071.0W	0740	1.6		1.5	4.4	12/05	17.4	W	50.5	12/04	1013.5
CARO3	43.3N	124.4W	0738	11.0					7.8	N	26.5	27/21	1014.2
CHLV2	36.9N	075.7W	0737	7.7	7.1	1.1	3.3	07/15	15.8	N	36.3	11/06	1016.2
CLKN7	34.6N	076.5W	0740	12.4					12.0	SW	29.6	11/14	1016.4
CSBF1	29.7N	085.4W	0740	16.2					7.4	W	22.0	11/01	1017.9
DBLN6	42.5N	079.4W	0740	0.1					14.2	SW	39.5	01/10	1014.2

BUOY	LAT	LONG	OBS	MEAN AIR TP (C)	MEAN SEA TP (C)	MEAN SIG WAVE HT (M)	MAX SIG WAVE HT (M)	MAX SIG WAVE HT (DA/HR)	SCALAR MEAN WIND SPEED (KNOTS)	PREV WIND (DIR)	MAX WIND (KTS)	MAX WIND (DA/HR)	MEAN PRESS (MB)
DESW1	47.7N	124.5W	0738	9.5									1016.2
DISW3	47.1N	090.7W	0741	-1.7					11.1	NE	28.6	17/10	1017.9
DPIA1	30.3N	088.1W	0739	16.1	17.3				11.4	SE	27.4	23/10	1017.2
DSLN7	35.2N	075.3W	0677	12.2	14.8	1.8	5.1	26/19	17.1	N	40.2	26/16	1015.4
FBIS1	32.7N	079.9W	0739	13.6					9.2	SW	21.6	19/18	1016.7
FFIA2	57.3N	133.6W	0738	4.3					12.0	SE	34.4	10/20	1015.5
FPSN7	33.5N	077.6W	0738	15.2	18.0				16.8	SW	44.2	26/11	1016.2
FWYF1	25.6N	080.1W	0738	22.1	23.2				14.0	E	30.2	25/15	1017.3
GBCL1	27.8N	093.1W	0741	19.0	21.1				14.7	SE	50.4	29/04	1016.9
GDIL1	29.3N	090.0W	0741	17.2	18.8				10.7	SE	28.4	20/11	1017.4
GLLN6	43.9N	076.5W	0740	-2.5					13.2	NW	31.7	12/20	1014.1
IOSN3	43.0N	070.6W	0384	1.3					15.1	NW	42.9	27/11	1014.7
MDRM1	44.0N	068.1W	0741	-1.2					17.0	NW	41.0	27/13	1013.4
MISM1	43.8N	068.9W	0741	-0.9					17.0	NW	45.5	27/14	1012.9
MLRF1	25.0N	080.4W	0738	22.3	23.8				12.7	SE	30.4	20/21	1016.7
MPCL1	29.4N	088.6W	0713	17.4	19.6				13.5	E	31.7	22/15	1018.0
NWPO3	44.6N	124.1W	0738	10.1					7.4	E	25.0	27/18	1015.3
PILM4	48.2N	088.4W	0736	-4.0					11.5	N	29.4	16/16	1017.2
PTAC1	39.0N	123.7W	0737	11.9					10.1	N	31.9	15/10	1014.3
PTAT2	27.8N	097.1W	0739	18.1	18.8				12.2	SE	29.5	28/04	1015.2
PTGC1	34.6N	120.7W	0736	13.8					12.3	NW	32.2	31/06	1014.5
ROAM4	47.9N	089.3W	0719	-3.6	0.5								1017.8
SANF1	24.5N	081.9W	0741	22.2	23.8				11.8	N	23.4	06/00	1016.9
SAUF1	29.9N	081.3W	0741	16.2	16.3				8.8	W	29.4	25/23	1017.2
SBIO1	41.6N	082.8W	0739	1.3					12.4	NW	31.3	10/17	1015.4
SGNW3	43.8N	087.7W	0697	0.7					9.9	N	32.7	09/17	1016.5
SISW1	48.3N	122.9W	0045	8.4					5.2	N	11.1	02/05	1008.0
SMKF1	24.6N	081.1W	0738	22.4	23.9				13.4	SE	30.0	24/00	1017.2
SPGF1	26.7N	079.0W	0741	21.9	24.3				8.6	E	26.5	25/11	1017.0
SRST2	29.7N	094.1W	0740	16.6					11.3	SE	34.6	18/10	1016.2
STDM4	47.2N	087.2W	0741	-2.7					13.4	N	34.0	17/08	
TPLM2	38.9N	076.4W	0741	5.6	5.5				12.3	W	37.1	11/10	1015.2
TTIW1	48.4N	124.7W	0738	9.0					9.8	NE	37.3	28/17	1016.4
VENF1	27.1N	082.5W	0739	18.2	19.9				9.1	NW	26.9	11/13	1017.6
WPOW1	47.7N	122.4W	0737	9.3					5.1	N	17.6	27/12	1015.5

The Life–Saving Museum of Virginia

Dedicated to Those Who Stood Ready to Serve

The Life–Saving Museum of Virginia is the only existing station in Virginia—among a mere handful on the entire Atlantic Coast—open to the public, preserving the history of the Life–Saving/Coast Guard Service, standing proudly at the ocean's edge. It is a tribute to the memories of those men and women who endured the hardships of the sea in peace and war, and of those who stood ready to serve.

✣Next Event✣

September 9– October 13, 1992

Batten Down the Hatches

a hurricane and storm exhibit

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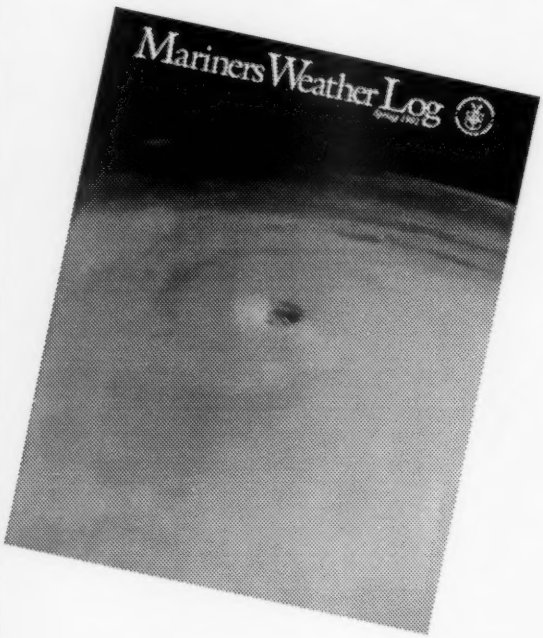

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